American Cyanamid Co.

Bee on a flower gathering nectar and pollen

THE UNIVERSAL STANDARD ENCYCLOPEDIA

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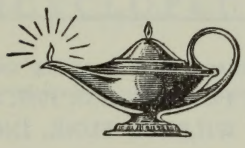

VOLUME 3

BEDWELL—BRONX

An abridgment of The New Funk & Wagnalls Encyclopedia
prepared under the editorial direction of
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Editor in Chief

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THE UNIVERSAL

STANDARD

ENCYCLOPEDIA

LIST OF ABBREVIATIONS USED

abbr., abbreviated
A.D., Anno Domini
alt., altitude
A.M., ante meridiem
anc., ancient
approx., approximately
Ar., Arabic
AS., Anglo-Saxon
A.S.S.R., Autonomous Soviet Socialist Republic
at.no., atomic number
at.wt., atomic weight
b., born
B.C., before Christ
b.p., boiling point
B.T.U., British Thermal Unit
Bulg., Bulgarian
C., centigrade, syn. Celsius
cent., century
Chin., Chinese
cm., centimeter
Co., County
colloq., colloquial
cu., cubic
Czech., Czechoslovakian
d., died
Dan., Danish
Du., Dutch
E., east, easterly, eastern
ed., edition
e.g., for example
Egypt., Egyptian
Eng., English
est., estimated
et seq., and following
F., Fahrenheit
fl., flourished
fr., from
Fr., French
ft., foot
Gael., Gaelic
Gen., General
Ger., German
Gr., Greek
Heb., Hebrew
Hind., Hindustani
Hon., Honorable
h.p., horsepower
hr., hour
Hung., Hungarian
I., Island
i.e., that is
in., inch
Ind., Indian
Ir., Irish
It., Italian
Jr., junior
kg., kilogram
km., kilometer
lat., latitude
Lat., Latin
lb., pound
lit., literally
long., longitude
m., mile
M., Middle
min., minute
M.L., Medieval Latin
mm., millimeter
mod., modern
m.p., melting point
M.P., Member of Parliament
m.p.h., miles per hour
Mt., Mount, Mountain
N., north, northerly, northern
N.T., New Testament
OE., Old English
OF., Old French
OHG., Old High German
ON., Old Norse
ONF., Old Norman French
O.T., Old Testament
oz., ounce
Phil., Philippine
P.M., post meridiem
Pol., Polish
pop., population
Port., Portuguese
prelim., preliminary
pron., pronounced
q.v., which see
R., River
rev., revised, revision
Rev., Reverend
Rom., Romanian
Russ., Russian
S., south, southerly, southern
sec., second
Skr., Sanskrit
Sp., Spanish
sp.gr., specific gravity
sq., square
S.S.R., Soviet Socialist Republic
Sum., Sumerian
Sw., Swedish
syn., synonym
temp., temperature
trans., translation, translated
Turk., Turkish
U.K., United Kingdom
U.N., United Nations
U.S., United States
U.S.A., United States of America
U.S.S.R., Union of Soviet Socialist Republics
var., variety
W., west, westerly, western
yd., yard

Note.—The official abbreviations for the States of the Union are used throughout. For academic degrees, see article DEGREES, ACADEMIC. Other abbreviations or contractions are self-explanatory.

BEDWELL, WILLIAM (1561?–1632), English scholar, educated at Cambridge University. He is generally considered the most important European linguist of his time, especially in the field of Arabic languages, and is best known for his translations of Arabic mathematical works into English, and the compilation of an Arabic dictionary. Bedwell was a member of the group of scholars who were appointed in 1611 by King James I of England to prepare the *Authorized Version* of the Bible.

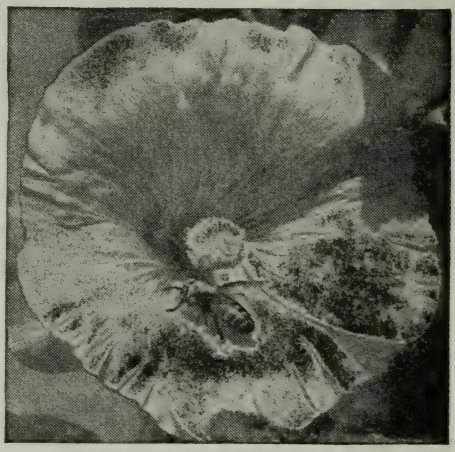
BEE, any of the hymenopterous insects of the superfamily Apoidea, especially the common honeybee, *Apis mellifera.* Several thousand varieties comprising Apoidea are divided into fourteen families. Of these the bumblebees, Bombidae (see BUMBLEBEE), and the honeybees, Apidae, are social insects living in highly organized communities; most of the rest are solitary insects, each nesting by itself. The solitary bees include the cuckoo bee, carpenter bee, and mason bee (qq.v.). The solitary bees, like other insects, have only two adult forms, male and female. The colony of the social bees, on the other hand, is made up of three adult forms: one functional female, the queen, whose sole work is to lay eggs; a limited number of males, the drones, raised only to mate with the young queens; and a great number of sexually undeveloped females, the workers, which gather nectar and pollen, make honey, care for the young, clean the hive, and perform all other work necessary for the maintenance of the colony.

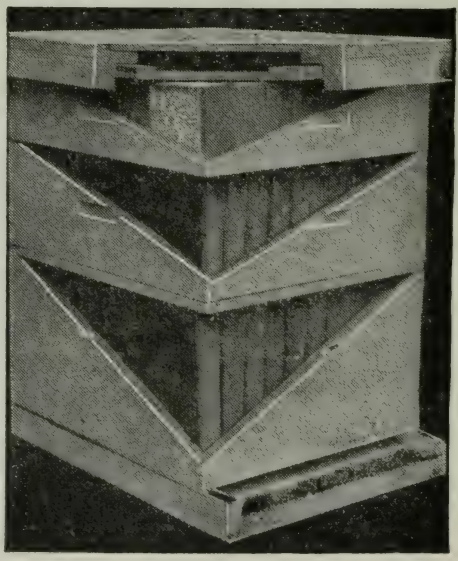
In the wild state, honeybees make their nests in hollow trees and similar cavities. They form permanent colonies, storing food for the winter. Bumblebees start a new colony each year. Queens and drones are produced late in the summer and, after mating, the queen hibernates alone, the rest of the colony dying off. In the spring she starts a new colony, producing only workers until late in the season when new queens and drones are hatched.

Honeybees have been domesticated since earliest times, and beekeeping was practiced by the ancient Egyptians and Greeks. Artificial hives, originally dome-shaped structures of plaited straw, are now mostly rectangular boxes of wood containing removable frames. Before placing the frames in the hive, the beekeeper inserts in each frame a sheet of wax, called a comb foundation, which the bees draw out to form the cells of the completed honeycomb. After the mating flight, the queen deposits an egg in each cell; fertilized eggs produce workers or queens, dependent only on the feeding of the larvae, and unfertilized eggs produce drones. The eggs hatch in approximately three days and the larvae are fed by the workers for several days. Queen larvae are fed during the entire larval stage a substance called royal jelly which is secreted by the workers; worker and drone larvae receive royal jelly for about three days and then honey and predigested pollen. The cells are then sealed and the larvae pupate. The queen is 5½ days a larva and 8½ days a pupa; the worker 6 and 11, and the drone 6 and 15 days, respectively. On the emergence of a new queen, the old queen and the older workers of the colony leave the hive in a swarm. They form a cluster on some nearby object, such as the branch of a tree, and, if not housed in a new hive within a short time, establish a new colony in the hollow of a tree. If a second new queen should be hatched in the one season, the new queen leads the ensuing swarm. When the hive is deprived of its queen through accident, and no queen larvae are developing, the workers produce a new queen by feeding royal jelly to a worker larva. In certain circumstances, workers may lay eggs which, not being fertilized, produce only drones.

During the honey flow (the season when flowers yield an abundance of nectar), the workers manufacture and store honey (q.v.) in the upper parts of the comb to serve as food for the winter. In cold weather honeybees become sluggish and dormant, but do not actually hibernate. They feed on the stored honey and, on warm, sunny days may take short flights for exercise.

In addition to honey, of which the United States produced about 23,000,000 gallons in 1952, bee glue, or propolis, and beeswax (q.v.) are honeybee products of economic importance. Bee venom, extracted from the sting glands, was formerly used in medicine in the treatment of rheumatism. All types of bees are of great importance in the pollination of flowers. For example, fruit growers main-



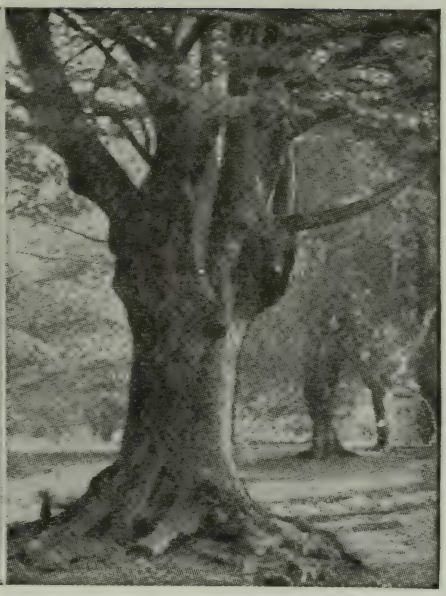


U.S.D.A., Bur. of Ent. & Plant Quarantine; American Bee Journal

Top, from left to right: Common honeybee worker, queen, and drone.
Above: Bumblebee (Bombus pennsylvanicus).
Right: Honeybee gathering nectar and pollen from a hollyhock flower.
Bottom, right: An artificial beehive with portions of the sides cut away to show the removable frames.

tain hives of honeybees to insure fertilization of the blossoms and the consequent good crop, and in Australia it was found necessary to introduce the bumblebee before red clover could be successfully grown there.

BEEBE, (CHARLES) WILLIAM (1877–), American scientist, born in Brooklyn, N.Y., and educated at Columbia University. Appointed curator of the New York Zoological Society in 1898, he originated the collection of living birds in the Bronx Park Zoo (New York City) and was largely responsible for bringing this collection up to the number of 900 species and 3000 specimens. In 1916 he became director of tropical research for the society, and in 1920 its honorary curator of birds. He headed scientific expeditions to Nova Scotia, Florida, Mexico, Venezuela, British Guiana, the Himalaya, Borneo, China,



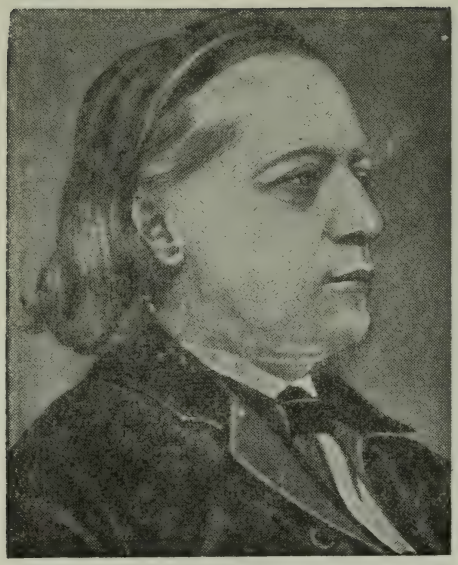
Left: Branch of the beech tree, showing the spiny cupules which contain the nuts. Right: European beech tree.

Japan, and other regions. Particularly notable was his exploration of parts of Ceylon, Burma, Tibet, Borneo, and other sections of Asia in search of data later published in his *Pheasants—Their Lives and Homes* (1926). In 1923 he headed an expedition to the Galápagos Islands in the ship *Noma* to study marine and land life, on the way making oceanographic studies in the Sargasso Sea. In 1925, in the ship *Arcturus*, he continued his exploration of the Sargasso Sea and investigated the Humboldt Current in the neighborhood of the Galápagos. He conducted many expeditions to the Bermuda Islands for zoological and oceanographic studies. Particularly important were the expeditions of 1930 and 1934 when he explored the ocean off Nonsuch Island, one of the Bermuda group, by descending 1400 feet into the water in 1930 and 3028 feet in 1934 by means of a spherical diving chamber, the bathysphere (q.v.). Among others of his books are *Galápagos, World's End* (1924); *Jungle Days* (1925); *The Arcturus Adventure* (1925); *Pheasant Jungles* (1927); *Beneath Tropic Seas* (1928); *Half Mile Down* (1934); *Book of Bays* (1942); *Book of Naturalists* (1944); *High Jungle* (1949); and *Unseen Life in New York* (1953). Selections from his previous writings were collected in *Adventuring With Beebe* (1955).

BEECH, common name for trees of the genus *Fagus* in the family Fagaceae, which contains also the oaks and the chestnuts. The genus contains eight species, which are natives of the temperate parts of the Northern Hemisphere. All are hardy, deciduous, ornamental trees growing, with spreading branches, to heights of 80 feet or more. The wood is hard and brittle, liable to rot when exposed to the air, but durable when kept under water and therefore useful for the construction of weirs and sluiceways. The fruit is an edible, three-cornered nut, much used in Europe as feed for poultry and pigs. It yields a bland, fixed oil used as a substitute for butter.

The European beech, *F. sylvatica*, grows to a height of 100 to 120 feet and a diameter of 4 feet, and forms pure forests in many parts of Europe. It has thin, ovate, toothed leaves which are dark, glossy green, finely ciliated on the margins. The bark is smooth and gray, sometimes approaching white. The American beech, *F. grandiflora*, is smaller, with lighter leaves and usually lighter bark.

Evergreen or antarctic beeches belong to the closely related genus *Nothofagus*, differing chiefly in being evergreen and having a colder range. About a dozen species are found in mountainous and colder parts of South America, New Zealand, and Australia.



Henry Ward Beecher

Blue beech and water beech are names for the hornbeam (q.v.).

BEECHAM, Sir Thomas (1879–), English orchestral conductor and operatic impresario, born in St. Helens, Lancashire, son of the English manufacturer Sir Joseph Beecham. Thomas Beecham was educated at Oxford University, but in music was largely self-taught. After touring in England with an opera company, he made his professional debut as a conductor with the Queen's Hall Orchestra in London in 1905. Between 1906 and 1909 he founded and conducted both the New Symphony Orchestra and the Beecham Symphony Orchestra In 1910 he began the presentation of the then little-known operas and symphonic music of such composers as the Englishman Frederick Delius, the German Richard Strauss, and the Frenchman Claude Debussy. In 1913 he conducted a series of Russian operas in which the Russian singer Feodor Chaliapin made his first appearance in England.

Beecham was knighted in 1916, and on his father's death in that year succeeded to the baronetcy. After 1920 he devoted himself principally to orchestral conducting in England and abroad, making, in 1928, the first of many appearances in the United States. In 1932 he founded the London Philharmonic Orchestra and became the artistic director of Covent Garden in London, at which he continued to present operatic productions. In 1940 he was conductor of the Seattle (Wash.) Symphony Orchestra, and in 1941 became a conductor at the Metropolitan Opera House in New York City. Beecham is the author of *A Mingled Chime* (1943), his autobiography.

BEECHER, Harriet Elizabeth. See Stowe, Harriet Beecher.

BEECHER, Henry Ward (1813–87), American clergyman, son of the American clergyman Lyman Beecher, born in Litchfield, Conn., and educated at Amherst College and at the Lane Theological Seminary in Cincinnati, Ohio. In 1847, after serving as pastor to Presbyterian congregations in Lawrenceburg, Ind., and Indianapolis, Ind., he became the pastor of the Plymouth Congregational Church in Brooklyn, N.Y. In this post, which he held for the remainder of his life, Beecher acquired a national reputation as one of the most famous pulpit orators and lecturers in American history. His theological views were in general orthodox, but he attracted and held huge audiences with his brilliant speeches and leadership at services and revival meetings and his espousal of such controversial causes as the biological theory of evolution and scientific historical study of Biblical texts. He also appeared on public platforms in the United States and England, and exercised great influence in discussions of the topical issues of the day.

Beecher was one of the earliest and best-known supporters of the abolitionists (q.v.), and was also an effective proponent of women's rights, particularly woman suffrage. From 1861 to 1863 he was editor in chief of the *Independent*, a religious and political periodical largely devoted to these causes, and from 1870 to 1881 he edited *The Christian Union* (later *The Outlook*), a similar publication. During this period, however, Beecher's career suffered a grave setback. His former friend and successor as editor of the *Independent*, the American journalist and author Theodore Tilton, brought suit for damages against Beecher in 1874, charging that Beecher had committed adultery with Tilton's wife. A trial held in that year ended in a disagreement by the jury, leaving Beecher's reputation uncleared, and though later investigations, including one by a council of Congregational churches, fully exonerated him, his later years remained clouded by the scandal.

Beecher's writings consist mainly of collections of reprinted sermons, lectures, and magazine articles. His other works include the novel *Norwood, or A Tale of Village Life*

in New England (1867) and *The Life of Jesus the Christ* (4 vols., 1871–91).

BEECHER, LYMAN (1775–1863), American clergyman, born in New Haven, Conn., and educated at Yale College. He became pastor of the Presbyterian Church at East Hampton, Long Island, in 1798. At this church, in 1804, he attained national prominence through his brilliant sermon on the death of the American statesman Alexander Hamilton (killed in a duel with the American political leader Aaron Burr). Beecher held pastorates successively at Litchfield, Conn., and Boston, Mass., between 1810 and 1832, and during this period he became known as one of the most eloquent preachers of his time. He also became known as one of the leaders of a Presbyterian faction, called the New School, which opposed the strict doctrine and discipline of the conservative Presbyterians, called the Old School. In 1832 he was appointed first president of Lane Theological Seminary, near Cincinnati, Ohio, and pastor of the Second Presbyterian Church of Cincinnati. His doctrinal liberalism soon brought him into conflict with his regional superiors. In 1835 he was brought to trial before the presbytery on charges of heresy and hypocrisy, but was acquitted. The Presbyterian Synod, to which the verdict was appealed, sustained his acquittal in the same year. When the schism foreshadowed by the Old School-New School controversy finally developed (1838), Beecher adhered to the New School. He continued to preach at his Cincinnati church until 1842, and retained the titular presidency of Lane Theological Seminary for the remainder of his life. He was the father of thirteen children; all of his seven sons became clergymen. His writings include *Collected Works* (3 vols., 1852) and *Autobiography and Correspondence* (1863).

BEECHEY, SIR WILLIAM (1753–1839), English painter, born in Burford, Oxfordshire. He entered the newly founded Royal Academy as a student in 1772 and in 1798 was knighted for his picture, now in the Hampton Court picture gallery at Hampton, England, which represents King George III reviewing troops. He was made a member of the Royal Academy, and in sixty-four years he exhibited 362 portraits at the exhibitions of that institution. Among the famous people whom he painted were the British naval hero Lord Nelson, the English soldier Lord Cornwallis, and the English actress Sarah Siddons. He is well represented in the National and the National Portrait galleries, London, and in many American collections, including that of the Metropolitan Museum of Art, in New York City.

BEE EATER, common name for birds of the family Meropidae in the order Coraciiformes. Numerous forms are known, widely distributed in the temperate and tropical parts of the Old World. They receive the common name from their diet, which consists almost entirely of bees and wasps. They have long, slender bills and swallowlike wings and are noted for their brilliant plumage. The common bee eater, *Merops apiaster*, of Europe, has a crown and mantle of chestnut, shading below into primrose; the head is black and white, the throat yellow, and the rest of the plumage greenish blue. Like the related family, the kingfishers, the bee eaters nest in holes which they dig in earthen banks. A round chamber is formed, at the end of a passage 6 to 8 feet long, in which the white eggs are deposited on bare earth.

BEEF. See MEAT.

BEE FLY, a fly of the family Bombyliidae, many species of which resemble bees in general appearance. Some bee flies resemble bumblebees, and others are more slender. They are flower flies, living upon the nectar of flowers, and are efficient agents in the cross fertilization of plants, the pollen adhering readily to their hairs. The larvae are parasitic in the egg pods of grasshoppers and also prey upon caterpillars, such as cutworms. See also DRONE FLY; SYRPHUS FLY.

BEELZEBUB, BEELZEBUL, or **BAALZEBUB** (derived ultimately from the Heb. *ba'al zebub*, "Lord of flies"), god of the ancient Philistine city of Ekron, mentioned in the Old Testament in 2 Kings 1:2. He was supposed to have the power of averting or controlling disease by dispersing the flies which infested the city. Beelzebub is mentioned in the New Testament, in Matthew 12:24 and Luke 11:15, as the prince of demons. In later literature, as in the English poet John Milton's *Paradise Lost*, Beelzebub is described as a principal associate of Satan. See BAAL.

BEER, generic term for fermented beverages made from malted cereal grains. Beer may be brewed from any starchy grain, but in the U.S. it is generally made from malted barley, with corn, rice, or sugar as a malt adjunct, and is flavored with hops (see BREWING). It varies with local custom throughout the world, depending on the materials and methods employed in brewing. In the U.S., the term "beer" is usually understood to mean *lager beer*, which contains, on

Pabst Brewing Co.

Monk brewing beer in medieval times (from an old print)

the average, 90 percent water, 3.5 percent alcohol by weight, 0.5 percent carbon dioxide, and 6 percent extractives consisting of proteins, carbohydrates, minerals, and aromatic flavorings. It is a popular beverage because it does not deteriorate during a long period of storage and is adaptable to all climates, and because it is produced by bottom-fermenting yeasts which develop the brew at relatively low temperatures. *Ale* (q.v.) is usually produced by top-fermenting yeasts; it has a higher alcoholic content, and a more pronounced flavor and aroma of hops. *Porter* is a type of ale which is richer and sweeter, containing less hop flavor. Dark, or caramelized, malt is used, which imparts the dark color and gives porter its rich, heavy body and creamy foam. *Stout* is similar to porter, but has a still heavier body, stronger hop flavor, and higher alcoholic content. *Bock beer* is a beer, high in flavor and alcoholic content, brewed during the winter especially for use in the spring. In certain localities the composition of the water is especially favorable for the production of a particular type of beer; such beers are frequently named for the cities of their origin, as, for example, Munich or Pilsener beer, and Burton ale.

Beer, by various names and in many forms, has been made all over the world from the earliest times. It was made by the ancient Mesopotamians and Egyptians, and afterward by the Greeks, Romans, and Gauls. Ale is believed to have originated among the early peoples of the British Isles. In Japan a kind of beer brewed from rice is called *sake*. The Crimean Tatars prepare a beer from millet seed. The same seed is used in Sikkim, on the southern slopes of the Himalaya, to make a beer called *murwa*. Arabians, Ethiopians, and many African tribes make beer of grains native to the region, such as teff, millet, and grass seeds, and of the usual grains. The Russians use rye to prepare *kvass*, or *rye beer*. *Weiss beer*, made from malted wheat, is produced to a limited extent, even in the U.S.

In the New World, the art of brewing was practiced by the Indians before the discoveries of Christopher Columbus, and the first Europeans to brew beer in America were the Virginia colonists of 1587. Commercial breweries were set up as early as 1633 in New Amsterdam (New York), 1637 in Massachusetts Bay Colony, and 1638 by Roger Williams in Rhode Island. William Penn was among Pennsylvania's pioneer brewers. His brewhouse, which stood more than two hundred years, was erected in Pennsbury, Bucks County, Pennsylvania, in 1683. George Washington had his own brewhouse, and his recipe for beer, in his own handwriting, is in the archives of the New York Public Library. Samuel Adams, "Father of the Revolution", was a brewer by profession.

Probably the most significant change from ancient to modern brewing occurred when the French biochemist Louis Pasteur proved (*Studies on Beer,* 1876) that yeast is the cause of fermentation (q.v.). Scientists carried Pasteur's work further and differentiated many species of yeast, classifying them in several families and showing their different effects in the brewing process. As a result of these studies, brewers began to use pure cultures of yeast, and were soon able to maintain exact controls throughout the whole brewing process.

Manufacture of beer was encouraged in early colonial laws in America as a means of reducing the consumption of stronger alcoholic beverages. This traditional policy was followed generally in the laws of the various States and the Federal government until World War I. Under wartime restrictions the brewing of beer was first limited and then prohibited. Beer containing more than 0.5 percent of alcohol was included in the pro-

hibition (q.v.) of intoxicating beverages by legislation under the 18th Amendment to the Constitution. Congress legalized beer containing 3.2 percent alcohol in March, 1933, and eight months later the prohibition amendment was repealed. The laws of the several States regulate the manufacture, distribution, and sale of beer within their jurisdictions, and provide for the licensing of brewers, distributors, and retailers. In addition, direct taxes are laid on beer by all the States and by the Federal government. Since the repeal of prohibition in 1933, Federal, State, and municipal taxes and license fees have amounted to about $12,851,000,000; Federal taxes alone came to $768,681,000 in the 1952–53 fiscal year. The annual world production of beer is nearly 200,000,000 barrels. Beer production in the U.S. was 84,544,253 barrels in 1952–53.

BEER, George Louis (1872–1920), American historian, born on Staten Island, New York City, and educated at Columbia University. From 1893 to 1897 he was a lecturer on European history at Columbia. In 1918–19 in Paris, Beer was chief of the Colonial Division of the American Commission to Negotiate Peace, and in 1919 was appointed director of the Mandatory Section of the League of Nations Secretariat. He is the author of a number of historical works, including *British Colonial Policy, 1754–65* (1907); *Origins of the British Colonial System, 1578–1660* (1908); and *The Old Colonial System, 1660–1754, Part I* (2 vols., 1912).

BEERBOHM, Sir Max (1872–1956), English author and caricaturist, half-brother of the actor Sir Herbert Beerbohm Tree, born in London, and educated at Charterhouse and at Merton College, Oxford University. He began his literary career with contributions to *The Yellow Book*, an illustrated quarterly published in England. The British publisher Alfred C. Harmsworth (later Lord Northcliffe) recognized his talent and secured his services for newspapers under his control. Thus launched, Beerbohm became a contributor to many London periodicals. As a caricaturist he emphasized the eccentricities and peculiarities of the leading figures of English social and political life in a long series of drawings which highly amused the London public. Excepting his one novel, *Zuleika Dobson* (1911), a satire on life at Oxford University, his books are composed largely of material originally contributed to periodicals. Beerbohm was knighted in 1939. Important among his works are his books of essays, *The Happy Hypocrite* (1897), *More* (1889), *And Even Now* (1920), and *Variety of Things* (1928); his book of parodies of authors of his day, *A Christmas Garland* (1912); his volumes of pictorial caricatures, *Twenty-five Gentlemen* (1896), *The Poet's Corner* (1904), *Rossetti and His Circle* (1922), and *Observations* (1925); a volume of lectures he delivered on the radio between 1935 and 1945, *Mainly on the Air* (1947); and a selected edition of his articles on the London theater, *Around Theatres* (reissued in 1953).

BEERBOHM TREE. See Tree, Sir Herbert Beerbohm.

Walter Engel

Room in a modern brewery where beer is allowed to stand and ferment in open tanks

BEERNAERT, Auguste Marie François (1829–1912), Belgian statesman, born in Ostend. He was elected a member of the Chamber of Deputies in 1874. In 1884 he received the portfolio of agriculture, industry, and art. Soon afterward he was appointed president of the Council and minister of finance. In 1895 he was elected president of the Chamber of Deputies. Beernaert was a leading member of the International Peace Conference, both in 1899 and in 1907. In 1909 he received one half of the Nobel Peace Prize.

BEEROTH, Biblical name of ancient Beroea (q.v.).

BEERS, Clifford Whittingham (1876–1943), American humanitarian, born in New Haven, Conn., and educated at Yale University. As a result of a mental breakdown he was confined (1900–03) in an asylum. After his recovery, he wrote a study of his experience, *A Mind That Found Itself* (1908), a book which was republished in successive editions for many years. Thereafter Beers devoted himself to the study and advancement of mental hygiene. He founded the Connecticut Society for Mental Hygiene in 1908, and similar organizations in later years, including, in 1931, the International Foundation for Mental Hygiene. In 1933 he was awarded the gold medal of the National Institute of Social Sciences for his "distinguished services for the benefit of mankind".

BEERS, Ethel Lynn, *nee* Ethelinda Eliot (1827–79), American poet, born in Goshen, N.Y. She is best known for the Civil War lyric "All Quiet Along the Potomac", which appeared in the periodical *Harper's Weekly* in 1861.

BEERS, Henry Augustin (1847–1926), American educator and author, born in Buffalo, N.Y., and educated at Yale University. He began to teach English literature at Yale in 1871; in 1880 he became professor, and in 1916 retired with the rank of professor emeritus. His chief works are *A Century of American Literature* (1878), *From Chaucer to Tennyson* (1890), *A History of English Romanticism in the Nineteenth Century* (1901), and *Milton's Tercentenary* (1910). Beers became known also as a frequent contributor to periodicals.

BEERS, Jan van (1821–88), Belgian poet, born in Antwerp. He was professor of Dutch language and literature at the Antwerp Atheneum. As one of the leaders in the movement for the revival of the Flemish language, he prepared special textbooks and wrote poems in Flemish.

BEERSHEBA (Herb. *beer*, "well"; *sheba*, "oath, or seven"), in Biblical times, a town in southern Judah in the territory of the tribe of Simeon. Its modern Arabic name is Bir es Saba. Two stories are told in explanation of the origin of the place and of the Hebrew name. According to the one (Gen. 21:22–31), the place received its name as the "well of oath", because of the alliance formed here between Abraham and Abimelech, King of Gerar, which was ratified by a gift of seven ewe lambs from Abraham to Abimelech as a witness of the fact that the well was dug by Abraham. In further commemoration of the event Abraham is said to have planted a tamarisk at the place and to have invoked the name of Yahwe. The other account (Gen. 26:26–33) ascribes the name-giving to Isaac and apparently explains it as the "well of seven".

Beersheba was situated in the extreme south of Palestine, about 52 miles southwest of Jersusalem. Its position led to the phrase "from Dan to Beersheba" as comprising Hebrew territory from north to south. Various interesting events are recorded by Biblical tradition as having taken place at Beersheba. After the Jews returned from captivity in Babylonia they occupied Beersheba. In the days of the Christian theologian and scholar Eusebius of Caesarea it was a great market town with a Roman garrison. Bishops of Beersheba are occasionally mentioned in early Church history. By the 14th century, however, it was deserted. There are extensive ruins on the northern bank of the Wadi es Saba. On that side of the valley are also the seven wells, which supply excellent water; they are all from 5 to 9 feet in diameter and about 45 feet deep.

The new town of Bir es Saba has grown up in recent years southwest of the old city, and has a population of about 3000. By the terms of the United Nations decision (1947) to partition Palestine into independent Jewish and Arab states, the town was allocated to the proposed Arab state. The armed forces of the newly created state of Israel occupied the town during the subsequent war between Israel and a coalition of Arab countries.

BEESWAX, a natural plastic wax, secreted by bees and used by them in making their cells and combs. It is a solid, melting at about 65° C. (149° F.), and varying in color from yellowish to blackish brown. It is insoluble in water but soluble in some organic solvents, e.g., carbon tetrachloride. Considerable quantities are produced in the U.S., South America, and the West Indies. Beeswax is used chiefly in

wax polishes, and in the making of church ceremonial candles in which its use is required for traditional and symbolic reasons.

BEET, common name for any plant of the genus *Beta* in the family Chenopodiaceae. The genus contains few species, mostly biennials, which bear smooth, ovate, petioled root leaves, and, later, tall, leafy, flowering stems. They are natives of the temperate parts of the Old World, and are now in general cultivation, chiefly for their large succulent roots, which are used as food for man and cattle, and as a source of sugar. The most important species, *B. vulgaris*, has four recognized varieties. Var. *cruenta* has small roots and large, showy, colored leaves; it is grown chiefly as a foliage plant in flower gardens. Chard (q.v.), var. *cicla*, has large leaves, which are cooked for greens, and thick leaf stalks, which also are edible. Mangel-wurzel, var. *macrorhiza*, has large, coarse roots; it is also called the fodder beet, and is raised extensively as a field crop for cattle.

Var. *crassa* has many subvarieties, distinguished by the depth of color and by the shape of the root, some being globular and others tap-rooted or carrot-shaped. The dark-red, globular type is most esteemed as a table vegetable, being extensively grown as a truck-garden crop, and sometimes under glass. Like all succulent roots, it has a high water content, 88 percent, and owes its food value chiefly to the 10 percent of carbohydrate it contains. Small percentages of protein, fat, fiber, and ash are also present, and the greens are rich in vitamins A and B. In 1952 beet production in the U.S. was about 164,400 tons, of which about 75 percent was canned. Another subvariety of *B. vulgaris crassa* is the sugar beet (q.v.), which has large conical roots, white in color, and with its percentage of sugar greatly increased by cultivation and selection (see SUGAR).

BEETHOVEN, LUDWIG VAN (1770–1827), German composer, born in Bonn. His father was a singer in the electoral chapel at Bonn, and his grandfather was *Kapellmeister* at the same chapel. When only four years old, Beethoven showed decided love for music, and his father began to instruct him on the piano and violin. In 1779 the boy was placed under the instruction of a private teacher in Bonn. Beethoven's unusual talent was so evident that the elector of Cologne assumed the expense of his further musical training, and from 1780 to 1791 he received his formal training from the court organists of Cologne. In 1787 Beethoven visited Vienna, at a time when his celebrated

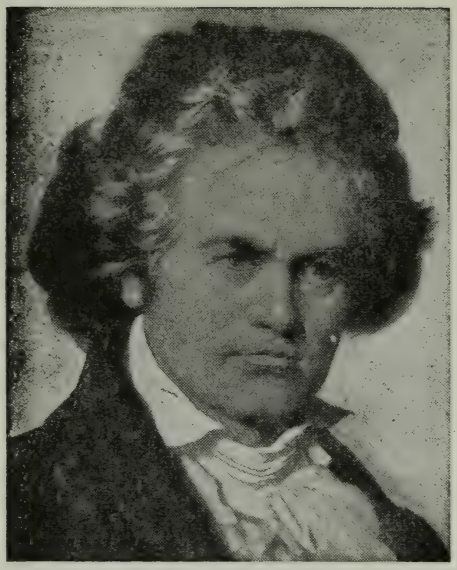
W. Atlee Burpee Co.

Beets (var. crassa), popular table vegetable

predecessors the Austrian composers Joseph Haydn and Wolfgang Amadeus Mozart were living there. On that occasion the boy's masterly improvisation elicited these prophetic words from Mozart: "Keep your eyes on him; some day he will make a stir in the world."

Beethoven returned to Vienna in 1792 to settle permanently. In his post of court organist of the elector of Cologne, an uncle of the reigning emperor of Austria, Leopold II, Beethoven was immediately admitted to the most exclusive circles. Without delay he began to study under Haydn, but before long the critical pupil discovered that the famous composer was a poor teacher. As arrangements had been made by the elector for Beethoven to study with Haydn personally, it was impossible to change teachers without giving offense. Therefore, Beethoven visited Haydn regularly, but secretly arranged for a thorough course in counterpoint with another teacher. When in 1793 Haydn undertook his second journey to England, he sent his pupil to the Austrian musical theorist Johann Georg Albrechtsberger, with whom Beethoven studied for a year.

In 1795 Beethoven began his public career. In March he appeared on the concert stage with his own concerto for piano and orchestra



Ludwig van Beethoven

in C, in the double role of virtuoso and composer, and in October his opus 1, three trios for piano, violin, and cello, appeared in print. In 1796 he visited Prague and played in the houses of the nobility. The flattering reception accorded to him in these circles induced him to visit also Dresden, Leipzig, and Berlin. In the Prussian capital he played at court, and King Frederick William II was so impressed that he tried to induce the young master to settle in Berlin.

On April 2, 1800, Beethoven gave the first concert of his own compositions. Of the works that were then performed for the first time, the beautiful Septet, op. 20, and the First Symphony, op. 21, quickly found their way into the regular concert repertoire throughout Austria and Germany and spread the fame of their author. At comparatively short intervals one great work followed another.

In 1808 Jerome Bonaparte, King of Westphalia, sought to attach the famous Vienna master to his own court at Cassel by offering him 600 gold ducats and the title of *Hofkapellmeister*. No sooner did this news become known in Vienna than a group of Viennese noblemen pledged themselves to the payment of 4000 florins annually if Beethoven would refuse the king's offer and remain in Vienna.

Up to that time the fame of Beethoven had been limited to the circles of musicians and the more serious music lovers. A concert given on December 8, 1813, established the master also in the popular favor. In the following year Beethoven's only opera, *Fidelio*—produced originally in 1805 without success—was thoroughly revised by him. In this new form it was received with favor on May 23, and has since then maintained a place in operatic repertoire.

About the year 1817 Beethoven's health, which had never been robust, began gradually to decline. From about 1798 his hearing had begun to fail, and in 1819 he became totally deaf. He still continued to compose, however, and during this time wrote some of his greatest works, including the Ninth Symphony and his finest string quartets, which he was unable to hear performed. His last years were spent in misery and ill-health.

In the works of Beethoven absolute instrumental music reached its culminating point. Haydn and Mozart had developed and definitely established the instrumental forms which Beethoven chose as the most fitting vehicle for the expression of his genius. He began exactly where his great predecessors had left off, but the nature of his genius led to an enormous expansion of prevailing forms, to an increase in the technical apparatus, to more exacting demands upon the mental power and mechanical skill of the executants, and to entirely new harmonic and rhythmic combinations. Beethoven demonstrated that in the hands of a master the sonata form (see SONATA) is adaptable to an infinite variety of content.

In its development the work of Beethoven shows three distinct phases. The first period extends from 1795 to 1803 and, roughly speaking, comprises the works bearing the opus numbers 1–50. In these works Beethoven still follows the paths of his predecessors, but by no means as a mere imitator. Even the very earliest works bear the impress of a powerful individuality.

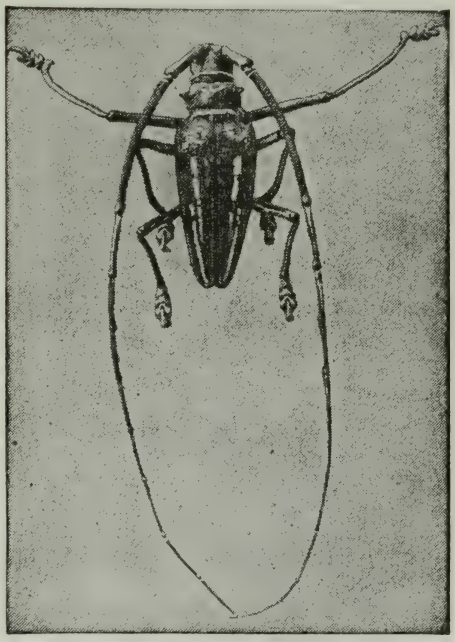
The second period extends from 1803 to 1815, comprising the works from about op. 53 to op. 100. Usually the Third Symphony (*Eroica*), op. 55, is regarded as ushering in this period. Such passionate, intense accents, such bold syncopations and incisive rhythms, and such startling dissonances had not been heard before. The advance in originality and power from the Second Symphony to the *Eroica* (written in 1802 and 1803 respectively) is remarkable. Henceforth sublimity, emotional intensity, and the masterly and highly personal development of conventional musical forms are the dominating characteristics of Beethoven's works. During his second period, according to most critics, he brought to full

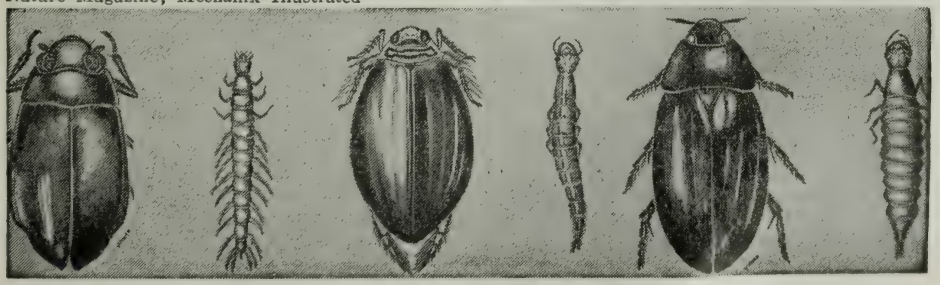
maturity such basic types of composition as the symphony, the string quartet, and the sonata for piano solo and for solo instruments with piano accompaniment.

The works of the third period, extending from 1816 to 1827 and comprising the opus numbers after 100, are characterized by colossal architectonic outline combined with minute elaboration of details. The extraordinary mastery of thematic development of the second period is carried to the utmost limits of refinement and subtlety. Rhythm in its infinite variety becomes almost an independent factor of emotional expression.

Beethoven wrote 9 symphonies, in C, op. 21; D, op. 36; E♭, op. 55; B♭, op. 60; C minor, op. 67; F (*Pastoral*), op. 68; A, op. 92; F, op. 93; D minor, op. 125; 9 overtures; 5 concertos for piano and orchestra; 1 concerto for violin and orchestra; 1 triple concerto for piano, violin, violoncello, and orchestra; 16 string quartets; 3 quintets; 2 sextets; 1 septet; 2 octets; 8 trios for violin, violoncello, and piano; 1 sonata for piano (4 hands); 38 sonatas for piano solo; 10 sonatas for violin and piano; 5 sonatas for violoncello and piano; 1 sonata for horn and piano; 2 fugues for string quartet and quintet respectively; 7 sets of variations for flute and piano; 3 sets for 'cello and piano; 2 sets for piano (4 hands); 21 sets for piano, solo; the opera *Fidelio;* the oratorio *Christus am Ölberge;* incidental music to *Prometheus, Die Ruinen von Athen, Egmont,* and *König Stephan;* 2 masses, in C major and in D (*Missa Solemnis*); the cantata *Der Glorreiche Augenblick; Meeresstille und Glückliche Fahrt;* an aria, *Ah Perfido!;* 18 canons; 67 songs; 7 books of English, Scotch, Irish, and Welsh songs for violin, violoncello, and piano; and a considerable number of smaller compositions for piano solo and for various combinations of instruments.

BEETLE, common name for insects of the order Coleoptera (Gr. *koleos,* "sheath"; *pteron,* "wing"), sometimes incorrectly applied to insects of other orders, such as roaches. Their most prominent characteristic is the *elytra,* the hardened, sheathlike front wings which in most beetles cover the entire abdomen when the insect is not in flight. In some beetles, such as the rove beetles (q.v.), the elytra are short, covering only a portion of the abdomen; a few beetles are wingless. Although beetles vary greatly in size (from more than 6 in. to less than 1/50 in. when adult) and form, they all show a general similarity in anatomical structure. Beetles undergo complete metamorphosis: the larvae are cylindrical grubs, with three pairs of legs on the thorax, and occa-





Right: Malay stick beetle (suborder Polyphaga), with antennae about 8 inches long. Below: Beetles and their larvae. Left to right, whirligig beetle (suborder Adephaga); diving beetle (suborder Adephaga); water scavenger beetle (suborder Polyphaga).

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sionally another pair on the last segment of the abdomen; the pupae are usually encased in a thin, light-colored skin with the legs free; the adults have biting mouth parts, in some cases enormously developed, as in the stag beetles (q.v.).

The order of beetles contains almost 200,000 different, known species, more than any other order of animals. There are hundreds of families; some contain only one or two species, while others, such as the weevils (q.v.), contain 30,000 species, far more, for example, than the total number of different warm-blooded animals. The classification of this enormous number of forms is extremely difficult. The order is generally divided into two or three suborders, Adephaga and Polyphaga, and sometimes Archostemata; these are subdivided into series and superfamilies. The families are divided into subfamilies, and subdivided into tribes and genera. Some coleopterists find still other groupings necessary to indicate the many relationships and differences among beetles.

Beetles are found under the most diverse conditions, and their habits vary widely. A few live in salt water, more in fresh water, and a small number breed in hot springs (see WATER BEETLE; DIVING BEETLE). Many beetles live under the bark of living and dead trees (see BARK BEETLE), and numerous beetles feed on the roots, wood, leaves, flowers, and fruit of living plants, causing great economic damage; see ENTOMOLOGY, ECONOMIC. Some beetles, such as the tiger beetle (q.v.), are carnivorous, hunting down their prey in much the same way that a tiger does; others are scavengers, living on dung (see SCARAB) or dead animals (see BURYING BEETLE). Others are parasites, or live in the nests of ants, bees, or termites, living on food brought into the nest by the hosts, or on the hosts themselves. Virtually every product of the animal or vegetable kingdom supplies some beetle with food (see BOOKWORM).

In addition to the articles referred to above, most of which describe a single family or superfamily, see BOMBARDIER BEETLE; COLORADO BEETLE; FIREFLY; GROUND BEETLE; JAPANESE BEETLE; LADYBIRD; LEAF BEETLE; MEAL WORM; DERMESTIDAE.

BEETS, NIKOLAAS (1814–1903), Dutch poet and author, born in Haarlem, and educated at the University of Leiden. He became professor of theology at the University of Utrecht in 1874. His *Camera Obscura* (1839), published under the pseudonym of Hildebrand, has been called the finest piece of prose in the Dutch literature of the 19th century. Among his poetic tales are *Ada van Holland* (1846) and *Guy de Vlaming* (1853). His lyric songs include *Korenbloemen* (1853), *Nieuwe Gedichten* (1857), *Verstrooide Gedichten* (1862), and *Harptoonen* (1892).

BEET SUGAR. See SUGAR; SUGAR BEET.

BEEVILLE, county seat of Bee Co., Texas, situated about 88 miles S.E. of San Antonio. The city is the chief broomcorn-marketing center in Texas, and is among the straw centers of the nation. Over 25 productive oil fields are located in the surrounding region, and the distribution of oil-field equipment is one of the city's chief enterprises. One of its principal manufacturing industries is the production of brooms. A livestock show and rodeo are held in Beeville annually. Beeville has a commission form of government. Pop. (1950) 9348.

BEFANA (corruption of It. *Epifania*, "Epiphany"), in Italy, a personification representing a woman who, according to tradition, was cleaning her house when the three wise men of the East passed on their way to offer their treasures to the infant Saviour. When called to watch them pass, she said she could do so when they came back. They went home by another way, and she has ever since been watching for their return. On Twelfth Night (Epiphany) she brings good children toys and sweetmeats, but to bad children she gives only ashes.

BEGAS, family of German painters and sculptors, the most noted of whom were the following. **1.** KARL BEGAS (1794–1854), painter, born in Heinsberg, near Aachen. He studied painting in Paris (1813–22) with Baron Antoine Jean Gros, and also in Italy (1822–24) while court painter to the king of Prussia. He successively adopted the viewpoints of the German Pre-Raphaelite, the romantic, and the realistic schools of painting. He is particularly noted for his historical and religious frescoes in Berlin churches, including "Baptism of Christ" and "Henry IV at Canossa"; and for his portraits of contemporary personages, including the German naturalist Alexander von Humboldt, the German philologist and mythologist Jacob Grimm, and the German composer Giacomo Meyerbeer. **2.** OSKAR BEGAS (1828–83), painter, born in Berlin, the oldest son of the preceding. Oskar was a historical, genre, and portrait painter. Among his works are "Descent from the Cross" (Michaeliskirche, Berlin), portraits of Emperor William I and General Helmuth von Moltke, and many landscapes. **3.** REINHOLD BEGAS (1831–

1911), sculptor, second son of Karl, born in Berlin, and trained in sculpture with Christian Daniel Rauch in Berlin. Among his works are the group "Borussia" (surmounting the Berlin Bourse), the immense statue of Emperor William I in Berlin, and "Pan Consoling a Deserted Nymph" **4.** KARL BEGAS (1845–1916), sculptor, brother of the two preceding, born in Berlin. Among his works are "Boar Hunt" (Tiergarten, Berlin), a monument commemorating the Franco-German War (Cassel), and many portrait busts and genre studies.

BEGGAR'S-LICE, common name for certain sticky or prickly fruits which cling to the clothes of passers-by. The name is applied also to the plants which produce these adherent, burlike fruits. Among plants given this name are the hound's-tongue, telegraph plant, and bedstraw (qq.v.), and plants of the genus *Lappula*, commonly called stickseed.

BEGGAR-TICKS. See BUR MARIGOLD.

BEGHARDS, semimonastic communities of laymen, originally composed of former artisans of the medieval craft guilds. The Beghards were celibate and pious, worked co-operatively, lived under a common roof, and shared their possessions. The oldest record of a Beghard community is that of the group in the city of Louvain (now in Belgium) in 1220, but it is probable that Beghard communities had been established during the preceding century in a number of cities in the duchies of Brabant and Flanders. In the 13th century the Beghards spread throughout the Rhine Valley and thence into Germany; a number of their communities were incorporated into the orders of the mendicant friars (q.v.).

As the Beghards spread, they became involved in various social movements of the time, adopting some of the doctrines of the Apostolic Brethren, the Fraticelli (q.v.), and the Brethren of the Free Spirit, a sect of anarchistic freethinkers of southern Germany. In 1311 the Council of Vienne, under Pope Clement V, denounced the Beghards as a heretical sect, and decreed the suppression of their communities. Pope John XXII in 1321 allowed them to resume their original mode of life, but from that time they gradually disappeared.

BEGIN or **BEIGIN,** MENACHEM (1913–), Israeli military leader, born in Brześć (Brest Litovsk), Poland. He studied law at the University of Warsaw, and became active in Betar, a youth movement seeking the establishment of Palestine as an independent Jewish state. Begin became head of the Betar in Czechoslovakia (1936) and Poland (1939), and in World War II fought against Germany with Polish armies in Russia. In 1943 he became commander in chief in Palestine of the Irgun Zvei Leumi ("National Military Organization"), the underground resistance force which fought to liberate Palestine from British rule. After the evacuation of the British forces in 1948 and the proclamation of the State of Israel, Begin and other members of the Irgun founded the Herut (Freedom Party), and Begin was elected a member of the Knesset, the Israeli parliament.

BEGONIA, common and scientific name for a genus of tropical plants, the only important genus in the family Begoniaceae, which is related to the Violet family. Hundreds of species and varieties are cultivated, either for their flowers, some shade of red or pink, or for their large, showy leaves, often colored or even variegated, and usually with the axis of the leaf curved, so that the leaves are longer on one side than on the other.

Begonias are either succulent herbs or low shrubs. They are divided into three groups, according to the form of the roots, which are fibrous, tuberous, or rhizomatous. The groups hydridize freely, so that no sharp dividing line can be drawn.

The genus *Begonia* was named for the French colonial administrator Michel Begon (1638–1710) in recognition of his patronage of science. The plant is known also as elephant's-ear.

BEGUINES, semimonastic communities of women, originally composed mainly of widows of the Crusaders of the Middle Ages. The Beguines took no vows, but led pious lives and devoted themselves to the care of the infirm and the poor. Occasionally they worked as teachers or performed manual labor. They retained what property they owned, and were free to withdraw from their communities to marry. Beguine communities were governed by *mistresses.*

The first Beguine community was established about 1180 in the city of Liége (now in Belgium), by Lambert le Bègue, a priest of that city. Following his death about 1187, Beguine communities, which included women of all classes, were established in what is now the Netherlands, and in France, Germany, and other European countries. In the 13th century a number of Beguine communities were incorporated in the orders of the mendicant friars (q.v.); others remained independent but be-

came societies of religious beggars. A number of Beguine communities became involved in various social movements of the time.

In 1311 the Council of Vienne, under Pope Clement V, denounced the Beguines as a heretical sect and ordered the suppression of their communities. They were vigorously persecuted by the Church in the 14th and 15th centuries. During the Reformation the Beguine communities were suppressed in the Protestant countries, and in the late 18th century they were suppressed in France during the Revolution. A number of Beguine communities, organized according to the original rules of the order, survive in the Netherlands, Belgium, and Germany, where their members are engaged in work among the poor.

BEHAR. See BIHAR.

BEHAVIORISM, a school of psychological doctrine which regards psychology as a scientific study of behavior and explains behavior as a system of responses to physical stimuli. According to the behaviorists, human activity is a quasimechanical play of instincts, reflexes, and habits. Sensation and perception are considered nonexistent, feeling is disregarded, and thought is reduced to the status of a reflex habit, essentially unspoken language.

The behaviorist school is associated with the name of the American psychologist John B. Watson, who coined the word behaviorism and was the most voluble exponent of its theories. His articles on the subject began to appear about 1913. Behaviorism was a reaction against the slow methods of experimental introspection developed by the German psychologist Wilhelm Wundt and the Anglo-American Edward Titchener. It was a challenge to the traditional preoccupation of psychology with consciousness, and a revolt in the direction of empiricism and objectivity. It was based on animal psychology, to which it is particularly applicable because of the comparative unimportance of ratiocination in animal behavior. The conditioned-reflex theory of the Russian physiologists Ivan Pavlov and Vladimir Bechterev was the foundation on which the English psychologist C. Lloyd Morgan (1852–1936) and the American psychologist Edward Lee Thorndike, and later John Watson, built the theory of behaviorism.

During the 1920's behaviorism had such a vogue that virtually every English-speaking psychologist was classified as a behaviorist or an antibehaviorist. Since that time behaviorism has been relegated by most psychologists to the position of being one among many valid approaches to psychology. In its positive aspects, by stressing the importance of observing and explaining behavior, it was a great advance. It was applied with some success to child psychology, but some of its tenets, such as the denial of the importance of maternal affection or a sense of security for the child, have been discredited. Its applications to abnormal adult psychology were always weak; it is difficult, for example, to explain hallucination in behavioristic terms without recourse to concepts of sensation or thought. See CONSCIOUSNESS; PSYCHOLOGY.

BEHEMOTH (Heb., plural of *b'hēmāh*, "beast", a word of Egyptian origin), in the Old Testament, the name of a large and strong four-footed beast (Enoch 60:7–9; Job 40:15–24; 4 Esdras 6:49–52). By some scholars it is thought to refer to a hippopotamus, and by others to an elephant.

BEHISTUN INSCRIPTION, a cuneiform inscription in the relief panel carved in the precipitous limestone rock of a mountain, 500 ft. above the present village of Behistun, or Bisutun, in W. Iran, 22 miles N.E. of Kermanshah. The inscription was carved in parallel columns, in the Old Persian, Assyrian, and Elamite languages, by order of the Persian king Darius I (558?–486 B.C.), and recounts his genealogy and conquests. The British Assyriologist Sir Henry Rawlinson began study of the rock in 1835 and deciphered, by 1846, the Persian part of the inscription. As a result of this achievement, the parallel columns of the Behistun Inscription became the key to the decipherment of other ancient Elamite and Assyrian writings.

BEHN, APHRA or AYFARA, *nee* JOHNSON (1640–89), English writer, born in Wye, Kent. She lived in Surinam (Dutch Guiana) until 1658, when she was brought to England. King Charles II employed her as a spy in Antwerp during the war of 1665–67 against the Dutch. Her services were unrewarded and she was later jailed for debt. Following her release, she pursued a literary career, becoming probably the first professional woman writer in England. Among her many works are *Forc'd Marriage* (1671), a play; and *Oroonoko* (about 1678), a novel about the adventures of an African prince whom she claimed to have met while he was a slave in Surinam.

BEHRE, CHARLES HENRY (1896–), American geologist, born in Atlanta, Ga., and educated at the University of Chicago. He was associate professor of economic geology at Northwestern University from 1930 to 1935, and full professor from 1935 to 1941. He became professor of geology at Columbia Uni-

versity in 1941. He also served as geologist on the United States Geological Survey after 1921, and on the Pennsylvania Geological Survey after 1922. He was member of many scientific societies, and editor of the *Bulletin* of the Geological Society of America.

BEHRING. See BERING.

BEHRING, EMIL ADOLPH VON (1854–1917), German physician, born in Hansdorf, Prussia, and educated at the University of Berlin. In 1880 he became an army surgeon. In 1894 he was appointed professor at the University of Halle, and in 1895 director of the Hygienic Institute at Marburg, a post he held until his death. In 1890, while working in the laboratory of the German bacteriologist Robert Koch, in Berlin, with the Japanese bacteriologist Shibasaburo Kitazato, Behring discovered the principle still known as Behring's law: that the blood serum of an individual who has contracted and survived a disease, and has thus developed an immunity to that disease, can be injected into another individual in whom it will produce immunity to the same disease. This principle, first discovered in connection with tetanus, was applied the following year to diphtheria with dramatically successful results. Behring also developed a serum which he called "tulase" for inducing in cattle immunity to tuberculosis. In 1901 he was awarded the first Nobel Prize in medicine.

BEHRMAN, SAMUEL NATHANIEL (1893–), American playwright, born in Worcester, Mass., and educated at Clark College and Harvard University. At the latter institution he was a member of the famous class in playwriting conducted by the American teacher George Pierce Baker and known as the 47 Workshop. In 1918 Behrman was assistant book review editor of *The New York Times*. He contributed to the periodicals *Smart Set*, *New Republic*, *Seven Arts*, *The Masses*, and *The New Yorker*. In 1938 Behrman was one of the organizers of the Playwrights Producing Association. Among his plays, for the most part comedies distinguished by their brilliant dialogue, are *The Second Man* (1927), *Serena Blandish* (1928), *Meteor* (1929), *Brief Moment* (1932), *Biography* (1933), *Rain from Heaven* (1935), *Amphitryon 38* (adapted from the play by the French dramatist Jean Giraudoux, 1937), *No Time for Comedy* (1939), *The Talley Method* (1940), *Dunnigan's Daughter* (1945), *Jane* (adapted from the short story by the British author W. Somerset Maugham, 1946), and *Fanny* (musical comedy, with Joshua Logan, 1954). He wrote extensively for motion pictures, and is the author of *Joseph Duveen* (biography, 1952) and *Worcester Account* (autobiographical, 1954).

BEING. See ONTOLOGY.

BEIRA, seaport and capital of Manica and Sofala Province, Mozambique (Portuguese East Africa), on the Mozambique Channel of the Indian Ocean, at the mouth of the navigable Pungwe R. It is connected by railroad with Rhodesia, the Union of South Africa, the Belgian Congo, and the British protectorate of Nyasaland, and it is the chief port for Nyasaland, Southern Rhodesia, and central Mozambique. Sugar, corn, rubber, cotton, fruits, gold, and chrome ore are the chief articles of export trade in the town; cotton and iron manufactured goods and foodstuffs are imported. Before 1942, when the province of Manica and Sofala was incorporated into Mozambique, Beira was the capital of the territory of the Portuguese-chartered Companhia de Moçambique. Pop. (1950) 42,549.

BEIRA, former province of Portugal, situated in the N. central portion of the country and adjoining the Atlantic Ocean. The interior of the Beira region, which is now occupied by Beira Alta Province, Beira Baixa Province, and part of Beira Litoral Province, is generally mountainous. Serra da Estrella, the chief range of the region, attains a maximum elevation of 6532 ft., the highest in Portugal. In the coastal area the terrain consists of a broad, level plain. The principal products of the region are olives, olive oil, cereals, chestnuts, fruits, and wine. Sheep and hogs are raised, and a variety of mineral deposits, including salt, coal, iron ore, and marble, are worked. The former capital is Coimbra (q.v.), now capital of Beira Litoral Province. Area of former province, 9208 sq.m.; pop. (1940) 1,900,946.

BEIRA ALTA, province of Portugal, bounded by the Douro R. on the N., by Spain on the E., by Beira Baixa province on the S., and by Beira Litoral Province on the W. The province comprises the N.E. portion of the former province of Beira (q.v.). For administrative purposes Beira Alta is divided into the districts of Viseu and Guarda. Viseu (pop. in 1940, 13,499) is the capital. Area of province, 3681 sq.m.; pop. (1950) 691,713.

BEIRA BAIXA, province of Portugal, bounded by Beira Alta province on the N., by Spain on the E., by Alto Alentjo and Ribatejo provinces on the S., and by Beira Litoral Province on the W. The province comprises the S.E. portion of the former province of Beira (q.v.) and is coextensive with Castelo

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View of section of Beirut near the harbor, showing Lebanon Mountains in background

Branco District. Castelo Branco (pop. in 1940, 9293) is the capital. Area of province, 2897 sq.m.; pop. (1950) 355,806.

BEIRA LITORAL, province of Portugal, bounded by the Douro R. on the N., by Beira Alta, Beira Baixa, and Ribatejo provinces on the E., by Estremadura Province on the S., and by the Atlantic Ocean on the W. The province comprises the E. portion of the former province of Beira (q.v.) and part of the old province of Estremadura. For administrative purposes Beira Litoral is divided into the districts of Aveiro, Coimbra, and Leira. The provincial capital is Coimbra (q.v.). Area of province, 2907 sq.m.; pop. (1950) 969,166.

BEIRAM. See BAIRAM.

BEIRUT or **BEYROUTH** (anc. *Berytus*), capital, largest city, and chief seaport of Lebanon, situated on the Mediterranean Sea, on a promontory sloping from the Lebanon range of mountains. The city is 93 m. by rail N.W. of Damascus, and is connected by rail also with Tripoli, in Lebanon, and with Haifa, in Israel. It is an ancient town with modern suburbs, and is considered one of the most healthful cities in Lebanon. Beirut contains numerous mosques and Christian churches, and a number of educational institutions maintained chiefly by Roman Catholic and Protestant missions. Of particular note are the American and French universities, possessing faculties in medicine and other fields; 3351 students were enrolled in 1953. The Lebanese University opened in 1951 and had 186 students in 1953.

Silk and cotton fabrics and gold and silver articles are the chief manufactures. The leading exports are silk, cotton textiles, fruits, hides, livestock, wool, and silk cocoons. Imports include building materials, clothing, and foodstuffs.

Beirut, which was mentioned in the Tell el-Amarna tablets as early as the 15th century B.C., is the Berytus of the classical writers. Under the Roman emperors it was the seat of a school of law. In 635 it was conquered by the Arabs, and it was besieged and captured by Baldwin I, King of Jerusalem, in 1110. In 1187 it was retaken by Saladin, Sultan of Egypt and Syria. It later passed under the power of the Druses, a Syrian religious sect, who maintained control of it until the 19th century. In 1840 it was bombarded and taken by the British, who ceded it to the Turks. On October 8, 1918, during World War I, the city was captured by Allied forces under the command of the British general Edmund Henry Hynman Allenby. Beirut became the capital of the newly created state of Lebanon in 1920. Pop. (1949) 201,451.

BEJA, name given to three groups of Hamitic tribes living in the Anglo-Egyptian Sudan. The groups are the Bisharin, the Hadenoa, and the Beni Amer (qq.v.).

BÉKÉSCSABA, city of Békés Co., Hungary, about 120 miles S.E. of Budapest. The city is the commercial center of a farm region produc-

ing cattle, wine, wheat, and hemp. The women of Békéscsaba are noted for their skill in making linen and hemp fabrics. Pop. (1941) 52,404.

BEL, the supreme god, or one of the chief gods, of the Babylonians (Isa. 46). The word is the Chaldaic form of Baal (q.v.), and Bel is believed by some to be identical with that god. The name "Bel", like the equivalent Hebrew "Ba'al", was used also in the sense of "lord" or "owner". Bel presided over the air. His wife was Belit. Bel was identified with Zeus by the Greek historian Herodotus, and was believed by the English Orientalist George Rawlinson to have been different from the Syrian Baal. As Bel-Merodach the god was connected with the planet Jupiter, with which, in the astral mythology, the productive power of nature is associated.

BEL AND THE DRAGON, an apocryphal book of the Old Testament consisting of two legends setting forth the wisdom of the prophet Daniel. In the Septuagint and other translations of the Bible the legends are attached to the canonical book of Daniel, as are the Song of the Three Holy Children and Susanna. See APOCRYPHA.

BELASCO, DAVID (1859–1931), American playwright, theatrical producer, and theater manager, born in San Francisco, Calif., and educated at Lincoln College, Calif. His first play to meet with success, *Hearts of Gold*, was produced in Chicago, Ill., in 1879. From 1880 to 1887 Belasco was manager of the Madison Square Theater, New York City, and from the latter year until 1902, in association with the celebrated American theater manager Daniel Frohman, he managed the Lyceum Theater, New York City. During this period Belasco established his reputation as one of the most popular of contemporary American playwrights, particularly with such melodramas as *The Girl I Left Behind Me* (1893) and *Heart of Maryland* (1895). The first-named play, and many of Belasco's later works, was written as a collaboration with a lesser-known playwright.

He also became famous as a producer, staging plays as vehicles for such notable American actors and actresses as E. H. Sothern, David Warfield, Blanche Bates, Mrs. Leslie Carter, and Ina Claire. His most important contribution to American theatrical history, however, lay in his methods of staging. During the 20th century, when, from 1902 until his death, he owned and operated the Belasco Theater in New York City, Belasco permanently influenced American production techniques through his insistence on natural styles of acting, elaborate theater facilities, and, above all, minutely realistic stage settings and properties. The last-named feature of his productions extended to such extreme measures, nationally famous in their day, as the preparation and consumption of genuine food during the course of a play and the transportation to a theater stage of real rooms and even large parts of buildings. Though Belasco's exploitation of such devices was condemned as sensational by many critics, he founded a tradition of literal realism in stage presentations which persisted in the American theater after his death.

Belasco's later plays included *Madam Butterfly* (1900) and *The Girl of the Golden West* (1905), both later used as the bases for operas by the Italian composer Giacomo Puccini; *The Return of Peter Grimm* (1911); and *Laugh, Clown, Laugh* (1923).

BELCHER, JONATHAN (1682–1757), American colonial governor, born in Cambridge, Mass., and educated at Harvard College. In 1730 he was made governor of Massachusetts and New Hampshire, but was removed (1741) after a highly unpopular administration. He was later (1747) appointed governor of New Jersey, a position which he held until his death.

BELÉM or **PARÁ,** capital of Pará State, N. Brazil, and chief port of the lower Amazon R. The city is situated near the equator, on the S. shore of the Pará R. estuary; it is about 90 miles from the Atlantic Ocean, and is accessible to ocean steamers. Founded in 1615 by the Portuguese as Nossa Senhora de Belém ("Our Lady of Bethlehem"), Belém owes its commercial importance to the opening of the Amazon to foreign trade in the latter part of the 19th century. The principal item of trade is rubber; other products include nuts, cacao, and timber. The city is one of the most attractive in South America, with numerous public squares and gardens, and regular, well-paved streets, many of which extend to the edge of the jungle. Among noteworthy points of interest is the white marble Teatro da Paz, one of the largest theaters in Brazil. Since 1723 Belém has been the see of a Roman Catholic bishop. Pop. (1950) 225,218.

BELFAST, seaport city, county borough, administrative center of County Antrim, and capital of Northern Ireland. The city is situated at the entrance of the Lagan R. into Belfast Lough, 12 miles from the North

Channel of the Irish Sea, and 113 miles N. of Dublin. Although it forms a separate administrative district in itself, geographically the city is divided by the Lagan R. between County Antrim to the west and County Down to the east.

Early in the 16th century Belfast was a fishing village in the control of the house of O'Neill. It developed into a fortified town which in 1613 was granted a charter by King James I and gradually became important as a port of trade. The linen industry was furthered by Huguenots who, after the revocation of the Edict of Nantes (the royal decree granting religious freedom to French Protestants) by the French king Louis XIV in 1685, had emigrated to Ireland. Cotton manufacture was introduced in 1771, and shipbuilding on a large scale began in 1796. Before the division of Ireland into Northern Ireland and Irish Free State as a result of the Government of Ireland Act of 1920 and its amendment of 1922, Belfast was capital of the province of Ulster. Numerous disturbances occurred in the city during the struggles (1919–21) between the Catholic and Protestant groups over the proposed partition of Ulster. After 1922 such disturbances ceased.

Belfast is a center of the British linen industry and of shipbuilding. Besides linen, large quantities of whisky, sparkling waters, rope, artificial manures, and tobacco goods are manufactured in the city. Queen's University of Belfast, established in 1909, was originally a college of the Queen's University of Ireland. Pop. (1951 prelim.) 443,680

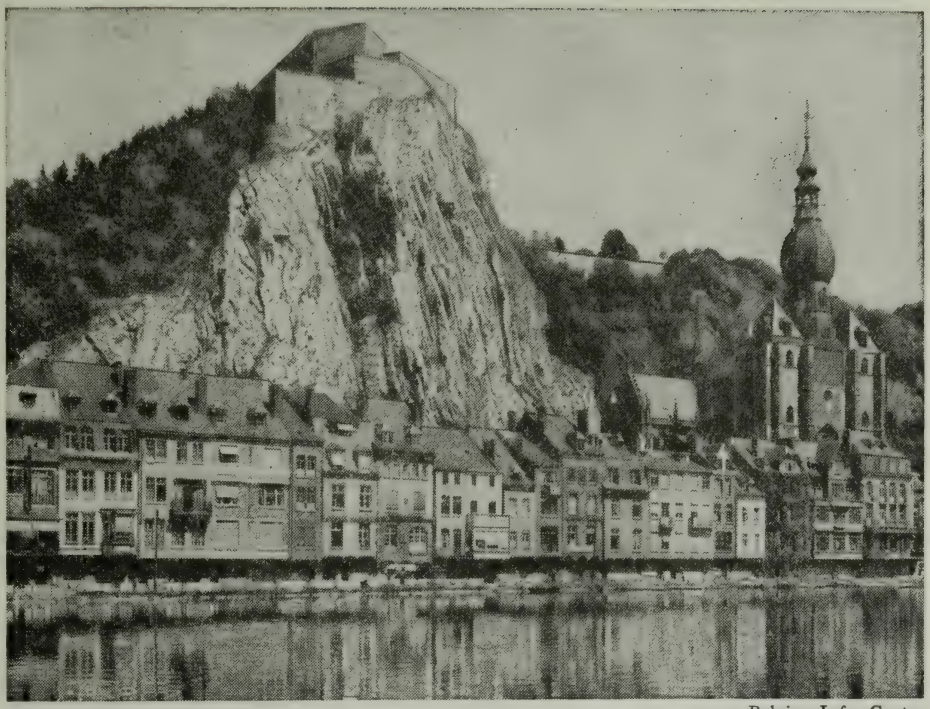
BELFAST, QUEEN'S UNIVERSITY OF, nonsectarian coeducational institution of higher learning, located in Belfast, Northern Ireland, and supported principally by government subsidies. It was established as Queen's College, a unit of the Royal University of Ireland, in 1849 and was reconstituted a separate university in 1909. The university offers instruction in agriculture, applied science and technology, the arts, commerce, dentistry, economics, education, law, medicine, science, and social studies. Courses in applied science are provided through the Municipal College of Technology, an affiliated institution. Theological studies for candidates for the Presbyterian ministry are available through the Presbyterian College, which is financially independent of the university. The university confers the bachelor's, master's, and doctor's degrees and licentiates in various specialties. The library contains 150,000 volumes. In 1954–55 enrollment totaled 2590 students and the faculty numbered 315.

BELFORT, capital of the department of the same name on the eastern frontier of France. The department was originally part of the Alsatian department of Haut-Rhin, and the only portion of that department remaining in France after the German acquisition of Alsace-Lorraine (q.v.) in 1871. When Haut-Rhin was returned to France after World War I, Belfort remained a separate department, known officially as Territoire de Belfort. The chief industries of the department are agriculture, cattle raising, mining, and the manufacture of iron, cotton, and woolen goods. The city of Belfort on the Savoureuse R., about 88 miles E.N.E. of Dijon, is of military importance, commanding the Trouée-de-Belfort pass between the Vosges and Jura mountains. Machinery, clocks, iron wire, sheet iron, hats, beer, and leather are manufactured in the city, and there is a considerable trade in grain and wines. Area of department, 235 sq.m.; pop. (1953 est.) 96,000. Pop. of city (1946) 35,952.

BELFRY. See BELL TOWER.

BELGÆ, a Celtic-speaking people of antiquity, comprising one of the chief divisions of the Celtic linguistic stock found by invading Romans in *Gallia* (see GAUL). According to the Roman general, statesman, and historian Gaius Julius Cæsar, who recorded the first account in written history of the Belgæ, they inhabited mainly the region enclosed by what are now the Seine, Marne, Moselle, and Rhine rivers and the English Channel and the North Sea, i.e., the territory now occupied by Belgium, part of N.E. France, and a portion of the Netherlands. Some of the Belgæ had previously crossed the English Channel and settled in southern Britain, especially in the area corresponding to modern Sussex and Kent. The Belgæ were composed of numerous tribes, notably the Atrebates, Remi, Bellovaci, and Suessiones. They offered fierce resistance to Cæsar's legions, which began the conquest of *Gallia* in 58 B.C., but were forced to lay down their arms in 57 B.C. Five years later, however, they joined the unsuccessful rebellion led by the Gallic chieftain Vercingetorex. Their territory was then combined with adjacent conquered areas into the Roman province of *Gallia Belgica*, approximately one third of Gaul. In the view of some authorities the modern Belgians are probably descendants of the Belgæ.

BELGIAN CONGO. See CONGO, BELGIAN.



Belgian Info. Center

Dinant, a Belgian town in Namur Province, seen from the Meuse River, showing ruins of an 11th-century castle atop Bayard Rock, and the 13th-century church of Notre Dame

BELGIAN SHEEP DOG. See SHEEP DOG, BELGIAN.

BELGIUM (French, *Belgique*; Flemish, *België*), kingdom of N.W. Europe, bounded on the N. by the Netherlands and the North Sea, on the E. by Germany and Luxembourg, and on the S. and S.W. by France. The capital is Brussels. Overseas possessions are Belgian Congo (see CONGO, BELGIAN) and the mandated territory of Ruanda-Urundi (q.v.).

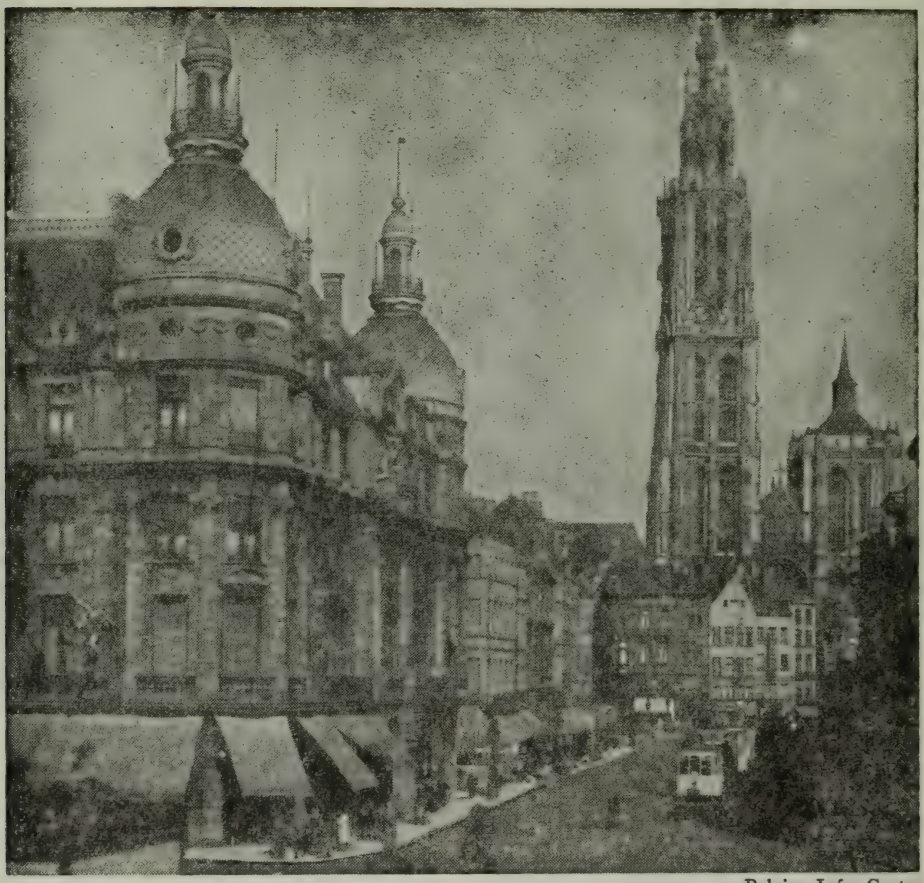
The area of Belgium is 11,774 sq.m.; pop. (1955 est.) 8,868,000. The nine provinces are Antwerp, Brabant, Flanders West, Flanders East, Hainaut, Liége, Limburg, Luxembourg, and Namur. The chief cities are Brussels, Antwerp, Ghent, Liége, Mechlin, Deurne, Bruges, Borgerhout, Berchem, Ostend, and Sint-Niklaas.

Physical Features. Belgium is situated in lat. 49° 40′ to 51° 30′ N.; long. 2° 32′ to 6° 24′ E. It is in the main a level, low-lying country, some parts of which, in Flanders, have to be protected by dikes from the encroachment of the sea.

The southeast is crossed by a branch of the Ardennes highlands, densely wooded but not attaining a height of more than 2000 feet. The Schelde and the Maas or Meuse are the chief rivers. They rise in France and flow into the North Sea. Both are navigable through Belgium. The climate near the sea is humid and mild. In the higher south-easterly districts, hot summers alternate with very cold winters. April and November are rainy months. Mean temperature at Brussels is 50° F. (36° in January, 65° in July).

Economic Features. Agriculture, mining, manufacturing, and foreign commerce are almost equally important factors in the national economy, enabling Belgium to support one of the densest populations in Europe (about 740 per sq.m.).

The greater part of the country is under cultivation. The subdivision of holdings is remarkable, more than half of them being less than three acres in extent. The leading crops are wheat, barley, oats, rye, potatoes, sugar beets, fodder beets, and tobacco. Practically all of the fruits common to temperate climates are grown. The pastoral industry, especially dairy farming, is also important. About 58 percent of the land is used for agriculture.



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Street scene in Antwerp, Belgium, with Cathedral of Notre Dame in background

Forests cover about one fifth of the area. The fisheries of the coastal and inland waters are a significant source of wealth.

Belgium is the most highly industrialized country of Europe, largely because of its vast resources of coal and iron. Over 1,000,000 persons were employed by more than 248,128 industrial establishments in 1948. Coal and iron mining and associated metal works form the major industry. Of lesser importance are the zinc, lead, copper, and manganese mines, and the stone quarries. The mineral resources are confined almost entirely to the provinces of Hainaut, Liége, Namur, and Luxembourg.

Associated with the iron and steel industry is the manufacture of machinery and railway equipment in Brussels and the shipbuilding industry in Antwerp. Centers of the century-old textile industry (linens, woolens, cottons, and more recently, synthetic fabrics) are Bruges, Brussels, Limburg, Ghent, Liége, Courtrai, and Mechlin. Carpets are made in large quantities at Brussels and Tournai, and Brussels and Bruges are noted for the manufacture of lace, fine lawn, and damask. Other large industries are beet-sugar refining, glass making, the manufacture of chemicals, and brewing. Antwerp is a diamond-cutting center.

Commerce. The foreign trade of Belgium and the duchy of Luxembourg is conducted jointly according to the provisions of a convention (1922) establishing an economic union and abolishing customs barriers between the two countries. In 1948 the Netherlands entered a customs union with Belgium and Luxembourg, known as the Benelux Customs Union (q.v.). In 1952 Belgo-Luxembourg foreign trade had an aggregate value of over 245 billion francs. Imports, chiefly machinery, motor vehicles, aircraft, cotton, wool, flax, diamonds, and foodstuffs, were valued at about 123 billion francs; exports, mainly iron and

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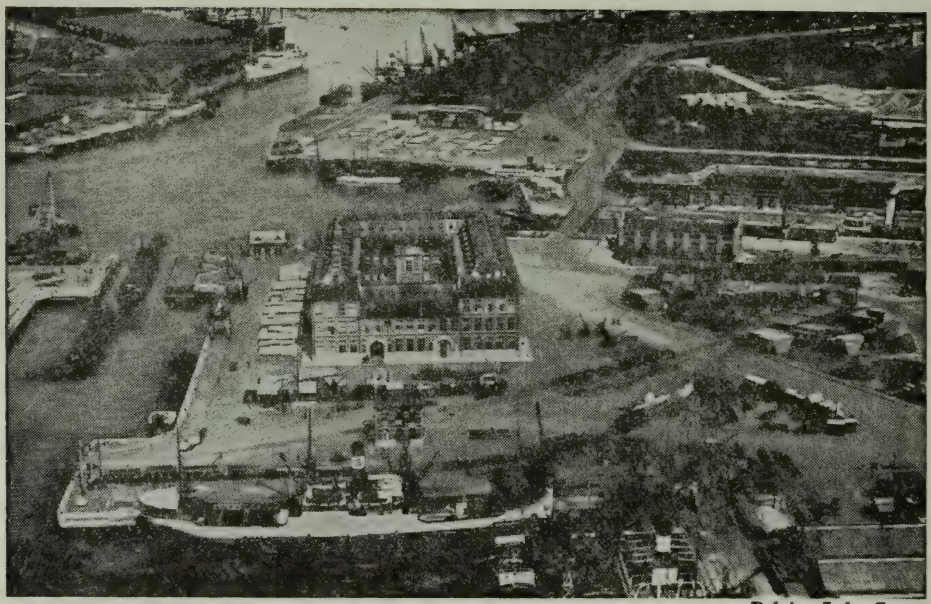
A "Gille," dignitary of a festival rooted in Belgian folklore, in the town of Binche



Belgian Info. Center

Harbor of Antwerp, Belgium, before destructive aerial bombings of World War II

steel manufactures, textiles, chemicals, cut diamonds, and glassware, were valued at about 122 billion francs. The United States, the Netherlands, West Germany, France, the United Kingdom, and Belgian Congo, in that order, are the principal sources of Belgo-Luxembourg imports. The leading markets for exports are the Netherlands, the United Kingdom, West Germany, the United States, France, and Belgian Congo.

Communications. With the exception of the North Sea port of Ostend, the chief access to the sea is by the mouths of the Schelde and Meuse rivers within the territory of the Netherlands. Antwerp, on the Schelde, although some 52 miles from the sea, is one of the world's busiest ports, served by more than 200 regular shipping lines. The rivers of Belgium are connected by an important system of canals. The length of the canals and navigable rivers totals (1952) 968 miles. Supplementing the waterways are (1952) about 6700 miles of public roads and about 300 miles of mainline railroads. No other country in the world has more miles of railroad per sq.m. Most of the railways are state-owned, but since 1926 the lines have been operated by a private company under government control.

People and Language. The people of Belgium are chiefly of two racial stocks, the Flemings (Teutonic origin) and the Walloons (Celtic origin, probably with an admixture of Alpine elements). The Flemings resemble their Dutch neighbors in their fair coloring and in their language, *Flemish*. Southern Belgians resemble the dark-haired French and speak a dialect of the French language.

For many years French was the official language of Belgium, causing a bitter language dispute between the French- and Flemish-speaking Belgians. In the 1930's, after years of controversy, a series of laws was passed by the Belgian Parliament, settling the problem by making Flemish also an official language. The language of the administration and of the schools in Flanders is Flemish, in the Walloon provinces it is French, and in the Brussels district both Flemish and French are officially used. The alternate language is an obligatory course of study in all secondary schools. In certain frontier districts and in the German-speaking districts of Eupen and Malmédy, special laws regulate the use of German.

Education. Education is free and compulsory for children from six to fourteen, and is under state control in the primary, secondary, and higher branches. In 1952–53 there were 13,205 elementary schools with 1,104,887 pupils and 768 secondary schools with 182,671 pupils; there were 17,299 students at the state universities of Ghent and Liége and the private universities of Brussels and Lou-

vain. A Royal Academy of Fine Arts is maintained at Antwerp, and five royal conservatories, at Brussels, Liége, Ghent, Antwerp, and Mons. There are also many private primary and secondary schools, schools of music and design, and several state agricultural institutes, commercial colleges, and normal schools.

Religion. The majority of the inhabitants are Roman Catholics. Religious liberty is granted by the Constitution, and part of the stipend of the ministers of all religions is paid by the state.

Government. Belgium is a constitutional, representative, and hereditary monarchy. Executive power is vested in the king, acting through a responsible ministry; legislative power is vested in the king and two chambers, namely, the Senate and Chamber of Representatives. The former is elected partly by direct popular elections, partly by the Senate itself, and partly by the provincial councils. The Chamber of Representatives is elected by direct suffrage. All males and females over twenty-one years of age are entitled to vote in the election of Parliament, and those who fail to vote are fined. Each province has a council chosen by direct vote and empowered to legislate in matters of local government. The provinces and the communes into which they are divided have considerable autonomy. In the communal elections all Belgians over twenty-one years of age are entitled to vote.

History. Belgium takes its name from the ancient Celtic people called the Belgæ (q.v.). The Roman province of Gallia Belgica embraced a much greater area than modern Belgium, extending from the mouth of the Schelde R. nearly to the Seine, and from the Strait of Dover to the range of the Vosges. After the disruption of the Frankish realm in the 9th century, the bulk of what is now Belgium was incorporated in the duchy of Lorraine (Lotharingia), which formed part of the realm of the eastern Franks (kingdom of Germany), while in the extreme west arose the county of Flanders, a fief of the kings of France. In the 10th century the northern half of Lorraine became the duchy of Lower Lorraine, the name of which was supplanted by that of Brabant in the 13th century. In 1384 Flanders was united with Burgundy, whose dukes by the middle of the 15th century had come into possession of the greater part of the Belgian and Dutch Netherlands. The rulers of Burgundy, though owing allegiance to the French crown, aimed at founding a powerful state between France and Germany. In furtherance of this objective they endeavored to repress the free republican spirit which manifested itself in the rapidly rising towns; but the work of establishing an absolute monarchy was interrupted by the death of the Burgundian duke Charles the Bold.

By the marriage (1477) of Mary of Burgundy, daughter of Charles the Bold, to the German king Maximilian, who later became Holy Roman emperor, all of the rich Burgundian realm except the duchy itself passed to the control of the Hapsburg (q.v.) family. Maximilian's grandson Charles, heir apparent to the Spanish crown, inherited the Netherlands (consisting of what are now Belgium and the Dutch kingdom) in 1506. When, in 1516, Charles ascended the throne of Spain, the Netherlands became part of the Spanish dominions. In 1549 Charles, who had meanwhile been designated Holy Roman emperor as Charles V, decreed the formal union of the Netherlands and Spain.

The despotic rule of the Spanish monarch Philip II, the son and successor of Charles, provoked in the Netherlands a long and sanguinary struggle for political and religious freedom. Antagonisms arising out of the Protestant Reformation largely determined the nature and outcome of the revolt, which lasted from 1567 to 1579. The southern provinces (Belgium) remained loyal to the Roman Catholic Church and to the Spanish crown; the northern provinces, a stronghold of Protestantism, won their independence as the United Provinces of the Netherlands.

In 1598 King Philip II ceded the Spanish Netherlands to his son-in-law Archduke Albert of Austria. The Spanish king, refusing to recognize Dutch independence, had meanwhile made several unsuccessful attempts to subdue the United Provinces. The struggle was resumed by Archduke Albert, but in 1609 he was compelled to conclude a twelve-year truce with his northern neighbors. During the ensuing period of peace the country, nominally an independent kingdom under the archduke, regained some of its former prosperity. On the death of Albert in 1621, his domain was returned to Spanish control; in the same year, the truce having expired, hostilities were renewed with the United Provinces.

The Spanish-Belgian forces suffered several severe defeats during the next decade, and in 1633 the Dutch arranged an alliance with France. A succession of Franco-Dutch victories finally forced the Spanish king Philip IV to accept (1648) a separate peace with the Dutch. Considerable Belgian territory was ceded to the United Provinces by the terms of

the settlement. In addition, the Dutch insisted on the perpetual closing of the Schelde R., Belgium's chief commercial artery. The war between Spain and France continued until 1659, with disastrous results for the Spanish and their Belgian province. By the Treaty of the Pyrenees, the county of Artois, Thionville, and other frontier points were given to France. Subsequent conquests by the same powerful neighbor secured to it, at the Peace of Aix-la-Chapelle (1668), the possession of Lille, Charleroi, Oudenarde, Kotrijk, and other towns. Charleroi and two other towns were restored at the Peace of Nijmegen (1678); but as a compensation, Valenciennes, Cambrai, Saint-Omer, Maubeuge, Ypres, Poperinghe, Cassel, and Bailleul were given up. Some of these towns were regained at the Peace of Ryswick in 1697.

The Spanish Netherlands became an important pawn in the next general European conflict, the War of the Spanish Succession (see SPANISH SUCCESSION, WAR OF THE). By the terms of the Peace of Utrecht, which concluded (1713) this conflict, Belgium was given to Austria. The Dutch received the right to garrison key Belgian fortresses along the French frontier. During the War of the Austrian Succession (1744), the country was almost completely occupied by the French, but was restored to Austria by the Treaty of Aix-la-Chapelle (1748).

Belgium remained undisturbed by the Seven Years' War, and during the long peace following the Treaty of Aix-la-Chapelle prosperity was restored. The ruling sovereign, Archduchess Maria Theresa of Austria, instituted a program of public works, including the construction of canals, encouraged the rehabilitation of agriculture and industry, and sponsored various beneficial administrative reforms. Holy Roman Emperor Joseph II, son and successor of Maria Theresa, further improved conditions in the Austrian province, notably by securing removal of the Dutch garrisons, but some of his administrative reforms created widespread discontent. Popular opposition to Joseph's rule culminated (October, 1789) in a general uprising. Most of the Austrian garrisons in the province were forced to capitulate, and on January 11, 1790, a Belgian republic was proclaimed. Factional strife shortly developed among the rebels, insuring the speedy downfall of the republic. By the following December the troops of Leopold II, who had meanwhile succeeded Joseph II, were in complete control of the country. Leopold revoked the objectionable reforms of his predecessor, but his regime won little popular support.

Leopold II was succeeded by Francis II in 1792. In the same year Austria, one of the chief centers of opposition to the French Revolution, became embroiled in war with France, and Belgium was occupied by a French army. The Austrians regained control of the province in 1793, but were again expelled by the French in 1794. By the Treaty of Campo Formio (1797) Francis II formally ceded the province to France.

The revolutionary regime installed in Belgium by the French received little popular support, but it endured until 1814. In that year the armies of the coalition of powers ranged against the French emperor Napoleon I in the Napoleonic Wars occupied the country. By the terms of the peace settlement adopted (1815) at the Congress of Vienna, Belgium was reunited with the Dutch Netherlands. The combined countries were officially designated the United Kingdom of Netherlands.

This action of the Congress of Vienna was completely arbitrary, as the people of the northern and southern parts of the United Kingdom differed essentially in religion, language, interests, and traditions. Liberals and Catholics were alike ready to revolt against Dutch supremacy. The outbreak of the French Revolution of 1830 set the example, and on the king's birthday (August 24, 1830), several riots occurred in various towns of Belgium. Dutch occupation of Brussels by an army of 14,000 men brought the revolutionary ferment in the Belgian nation to a climax. In seven days the people deposed the royal authorities and appointed a provisional government. Prince Frederick, the son of the Dutch king, who commanded the troops, was compelled to retreat from Brussels to Antwerp. On October 4, Belgium was declared independent by the provisional government. At a national congress on November 10, out of 200 votes only 13 were in favor of republican government. Meanwhile, representatives of Austria, Prussia, Russia, and Great Britain, the powers most concerned with this breach of the decisions reached at the Congress of Vienna, convened at London. On December 20, 1830, the conferees recognized the dissolution of the United Kingdom of the Netherlands as a *fait accompli*. The powers, unable to agree at first on a ruler for the Belgian kingdom, finally selected (June, 1831) Prince Leopold of Saxe-Coburg. A treaty legalizing the separation of Belgium from the United Kingdom was there-

upon drafted. William III, the Dutch ruler, refused to recognize the validity of this treaty and, on August 2, 1831, invaded Belgium. A French army compelled the Dutch to withdraw from the country. However, William III maintained his intransigent position with respect to Belgium, and in reprisal British and French fleets blockaded the Dutch coast. In May, 1833, the Dutch monarch obtained a truce with the intervening powers. A peace treaty between the Dutch and Belgians was finally signed in April, 1839. Provisions of the settlement included the allocation of the western half of the grand duchy of Luxembourg to Belgium, the award of the towns of Limburg and Maestricht to the Dutch, and guarantees by the European powers of Belgium's status as "an independent and perpetually neutral State".

On August 9, 1870, during the Franco-German War, Prussia reaffirmed its determination to respect the neutrality of Belgium, as also did France. These assurances were formally embodied in an agreement called the Treaty of London, among England, France, and Prussia, in the same year.

Leopold I was succeeded in 1865 by Leopold II. This monarch, a shrewd business man, financed exploration and settlement in the Congo basin of Africa, thereby laying the foundations of Belgium's immense colonial empire (see CONGO, BELGIAN). Leopold's nephew Albert I came to the throne in 1909. Five years later World War I broke out. Notwithstanding the Treaty of London German troops crossed the frontier into Belgium on August 4, 1914. The same evening the Belgian government resolved to resist invasion, and appealed for aid to France, Britain, and Russia. The Belgian army offered fierce and valiant resistance to the invaders, but by the end of November, 1914, the only Belgian towns not occupied by the Germans were Nieuport, Furnes, and Ypres. The Belgian troops held that little part of their country near Nieuport until September 28, 1918, when they joined in the general offensive which took the Allies into Ostend and Bruges, and freed the whole of the Belgian coast.

The total number of Belgians who lost their lives through the war amounted to more than 80,000. See YPRES; WORLD WAR I.

The Germans evacuated the country immediately after the armistice. Under the Treaty of Versailles, Eupen, Malmédy, and Moresnet were ceded by Germany, adding 382 sq.m. and 64,520 inhabitants to the kingdom.

At the end of World War I Belgium was faced with the task of rebuilding her devastated areas. The damage was put at $7,600,000,000. The country made a remarkable recovery, however, and by the end of 1922 her manufacturing industries were practically on a normal footing. Other commercial activities showed similar rapid gains. In 1923 Belgium joined France in the occupation of the Ruhr district, after a heated controversy with Germany over reparations payments.

Belgium was attacked for a second time by Germany on May 10, 1940. On that date, without warning or ultimatum, the Nazi air force bombed and machine-gunned Belgian aerodromes, stations, and communications centers and Nazi ground forces and parachutists invaded Belgian soil. The small Belgian army and the French and British troops which came to the aid of Belgium were powerless against the might of the Germans. Antwerp fell on the 18th. Namur, with its seven forts, held out until May 23. By May 26, British, French, and Belgian forces were trapped in northwestern Belgium with their backs to the North Sea. King Leopold III, commander in chief of the army, surrendered unconditionally on May 28, and was taken prisoner of war. The Belgian cabinet, meeting in Paris, unanimously refused to be associated with the king's action, declaring it "illegal and unconstitutional". On May 30, the cabinet voted to divest the king of all powers and the right to rule, a decision supported by the Belgian Parliament. The cabinet established a seat in London on Oct. 22, 1940. It returned to Brussels on Sept. 8, 1944. On Sept. 20, the Parliament elected as regent Prince Charles, Leopold's brother.

Although Belgium was in better economic condition after World War II than it had been after World War I, it was politically disorganized, due to the conflict between the Christian Social or Catholic Party and the Liberal-Socialist-Communist coalition. Intensifying the political struggle was the question concerning Leopold III, at that time in Austria awaiting determination of his future. Despite pressure from the Catholic Party, which desired the return of the king, the Belgian Parliament in the summer of 1945 extended indefinitely the regency of Prince Charles, virtually exiling the king because of his alleged defeatist attitude toward the German invaders.

On April 16, 1946, Belgium, the Netherlands, and Luxembourg, popularly known as the Benelux countries, concluded a customs and economic union at The Hague. Belgian troops

again entered Germany as an aftermath of war, in November, 1946, replacing British troops in the southern and eastern Ruhr and Rhineland.

While the struggle for political control continued within Belgium, the nation as a unit made important strides toward the assumption of its former position as one of the world's great trading nations. In the United Nations, of which the country had become a charter member on June 26, 1945, Belgium gave consistent support to the other western democracies during the intense ideological and political struggle (the so-called Cold War) with the Soviet Union and the states within the Soviet sphere of influence. Belgian diplomacy, in the realm of international politics generally, was marked by a similarly co-operative attitude toward the efforts of the democratic countries to accomplish economic recovery and to erect safeguards against possible communist aggression. The country participated in the European Recovery Program (q.v.), an American-sponsored plan (effectuated in April, 1948) designed to accelerate the rehabilitation of the war-torn economies of western Europe. Together with the other Benelux countries, France, and the United Kingdom, Belgium became, in 1948, a member of the Brussels Treaty Organization (q.v.). This step represented final abandonment of the country's traditional policy of neutrality. In April, 1949, Belgium signed the North Atlantic Treaty (q.v.), a defense pact aimed at the threat of Soviet aggression.

Among the chief events in domestic politics during the period under review was the withdrawal of the Belgian Communist Party from the progressive coalition in 1947. The outstanding developments on the domestic political scene, however, centered around the issue of Leopold's return to Belgium. On March 12, 1950, after more than a year of successive governmental crises brought on by the controversy, the Belgian electorate went to the polls in an advisory plebiscite on the question. The king's return from exile was favored by almost 57.7 percent of the voters. However, the Socialist and Liberal parties adamantly opposed Leopold's return. On July 20 the Belgian Parliament voted (198 to 0) for the king's return. With the exception of one Liberal, the entire opposition left the chamber before the vote was taken. During the following week strikes, demonstrations, and riots occurred in many urban areas of the country, creating grave possibilities of a civil war. The gravity of the situation was intensified when, on July 30, the police of Liége opened fire on a group of Socialists and killed three of them. On August 1, after consultations with government and political leaders, Leopold agreed to assign his royal prerogatives to his son Crown Prince Baudouin. The king further agreed to abdicate in Baudouin's favor on the prince's twenty-first birthday, in the following year. The period of national crisis ended when, on August 11, Baudouin took the oath of office as prince royal.

Leopold III abdicated on July 16, 1951, about two months before the prince's birthday, and Baudouin was formally proclaimed king on July 17. Belgium became a member of the European Coal and Steel Community (q.v.) on March 19. By the end of 1951 the country was the leading creditor in the European Payments Union.

In May, 1952, Belgium became a signatory, along with France, West Germany, Italy, and the other Benelux states, of the European Defense Community Treaty, a document providing for the creation of a supranational West European army.

Early in February, 1953, a severe storm in the North Sea caused the worst Belgian flood disaster in 200 years. The damage was estimated at $60 million. The parliament completed ratification of the E.D.C. Treaty on March 12, 1954. Parliamentary elections were held on April 11. The Socialists gained 9 seats in the lower house and the incumbent Social Christians lost 13 seats. On April 22 the Socialists and Liberals formed a coalition government. On October 23 Belgium, along with the other members of the Brussels Treaty Organization and N.A.T.O., signed agreements providing for the admission of West Germany into both organizations; the agreements were designed to replace the E.D.C. Treaty, which had been rejected by France in August. The Belgian parliament completed ratification of the agreements on April 6, 1955.

During May and June, 1955, King Baudouin paid a state visit to the Belgian Congo, the first made to the region by a Belgian monarch since 1928. Belgium and the United States reached agreement in June, 1955, on the peaceful uses of atomic energy; later in the year construction of an experimental reactor was begun in Mol-Donk, Antwerp Province. In August, 1956, 270 miners were trapped underground and killed when fire swept a coal mine in Marcinelle. The disaster was the worst in Belgian mining history.

BELGRADE (Serbian, *Beograd*), capital and largest city of Yugoslavia and of the

federated republic of Serbia, situated in the northeastern part of the country in the angle formed by the confluence of the Danube and Sava rivers. The city lies near deposits of coal and lead and is an industrial center, with plants engaged in the manufacture of beer, iron castings, and cloth. Belgrade is economically important also as a center, by rail and river, for Yugoslavia's export and import trade. Modern Belgrade dates from its evacuation by the Turks in 1866; after that time the city gradually lost its Oriental atmosphere.

Few European cities have witnessed more warfare than Belgrade. From the 3rd century B.C. to the 7th century A.D., Belgrade, then a fort or fortified town known as *Singidunum*, was held successively by the Celts, Romans, Huns, Sarmatians, Goths, and Gepids; then it was taken by the Byzantines, the Franks, the Bulgarians, and again by the Byzantines. The city continued throughout the Middle Ages to be the prize of hard-fought contests because of its strategic position on the route between Constantinople (now Istanbul) and Vienna; in addition Belgrade occupied a commanding post on the busy Danube R. The Byzantine Greeks, the Bulgarians, the Serbians, and the Hungarians were Belgrade's masters at various times from the 12th century to the beginning of the 16th century. The Turks captured the city in 1521, and it was not until 1866, some sixty years after the Serbian war for independence (resulting in Serbian autonomy within the Ottoman Empire), that Belgrade was finally freed from a Turkish garrison. During World War I the city was twice occupied by Austro-German troops, and was taken and held by German troops for the greater part of World War II. Pop. (1953) 469,988.

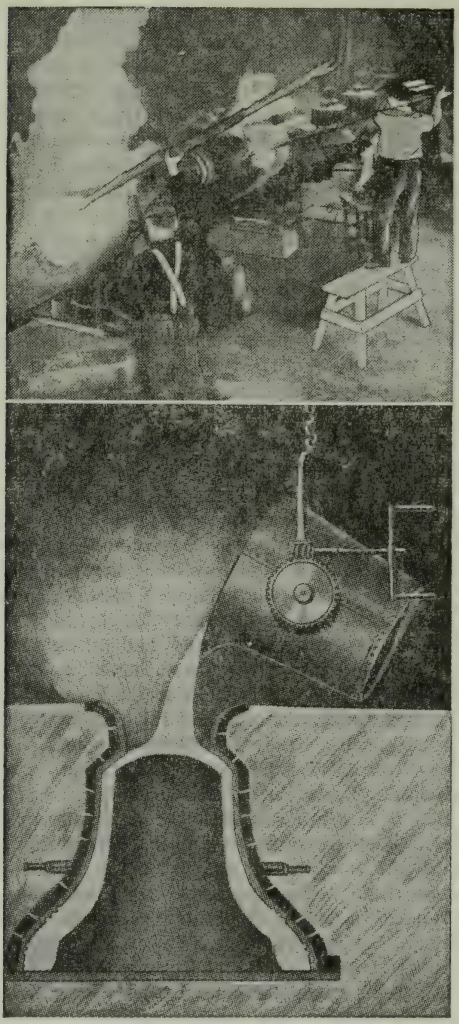
BELGRANO, MANUEL (1770–1820), Argentine military leader. In the revolutionary movement by which South America gained its freedom from Spanish rule, he led Argentine troops against the Spaniards in victorious battles at Tucumán (1812) and Salta (1813), both in the N.W part of Argentina. He was defeated by the Spaniards in Bolivia in 1813. In the following year he yielded his command to the Argentine general José de San Martín.

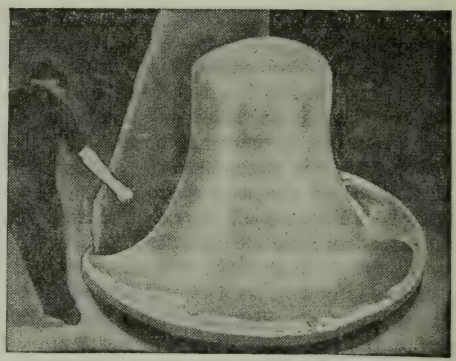
BELIAL, Hebrew word meaning "that which is without use or profit", "worthlessness", and hence "wickedness". It is used in the Bible chiefly in the forms "son of Belial" and "man of Belial", and has often been treated incorrectly, by translators of the Authorized Version, as a proper name, rather than as an abstract term.

BELINSKI, VISSARION GRIGORIEVICH (1810–48), Russian literary critic, born in Tchembar, Penza Region, Russia, and educated at the University of Moscow. His most important work, *Literary Reveries* (1834), is an informal history of Russian literature from the early 18th century until his own day. From 1840 until his death, while living in St. Petersburg (now Leningrad), Belinski wrote a series of widely read magazine articles on such contemporary Russian authors as Mikhail Lermontov, Nikolai Gogol, and Aleksander Pushkin. These essays were later reprinted in his collected works (posthumously published, 12 vols., 1859–62).

BELISARIUS (505?–65), Byzantine general, born in Germania, Illyria. He was appointed to a command of the army of the Eastern Roman Empire, and was stationed on the frontier of Persia (now Iran), where in 530 he first gained eminence by a victory over a Persian army vastly outnumbering his own. In 532, when the strife of the "Green" and the "Blue" factions in Constantinople (now Istanbul) endangered the throne and the empire, and the "Green" had proclaimed a new emperor to supersede Justinian, Belisarius, at the head of the imperial lifeguards, quelled the insurrection by the slaughter of 30,000 insurgents. In 533–34 he recovered Africa from the Vandals, and brought their king, Gelimer, a prisoner to Constantinople. In 535 Belisarius conquered Sicily, and then recovered Italy from the Ostrogoths, whose king, Vitiges, he captured at Ravenna in 540. He was again engaged against the Persians in 541–42. In 544 he once more commanded in Italy, and recaptured Rome from the Ostrogoths. He was, however, left unsupported, and in 548 his rival, the general Narses, who had rebelled against Belisarius' leadership in his earlier Italian campaigns, was appointed to the command in his place. After ten years' retirement Belisarius again came into prominence by defeating a Bulgarian invasion that threatened Constantinople. In 563 he was imprisoned for several months by Justinian on an accusation of conspiracy. The story that the hero was blinded and impoverished in his old age is unfounded, but has been exploited in fiction and art.

BELIZE, capital and chief seaport of the crown colony of British Honduras. It is also the capital of the district of Belize. The town is in the eastern part of the colony, on the Caribbean seacoast, at the mouth of the Belize River. It has been a trade center for the logwood and mahogany of the region for

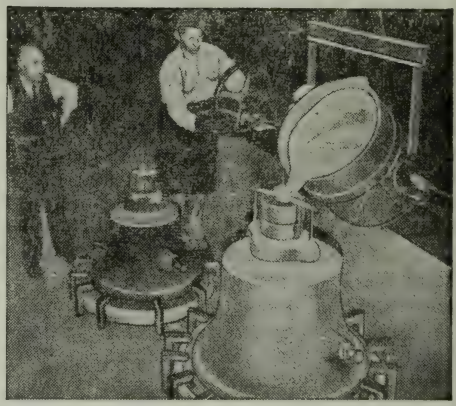




Meneely Bell Co.;
"Church Bells of England"

MAKING BELLS IN A BELL FOUNDRY

Above, left: Furnaces in which metals are fused to make the bell-metal alloy. Above: Shaping clay core of bell mold. Left: Drawing showing cross section of the core and shell of a bell mold. Below: Pouring molten metal into mold.



over three hundred years. Other articles produced in the district and exported are dried smilax roots used in the preparation of sarsaparilla, and bananas and citrus fruits. Area of district, 1623 sq.m.; pop. (1946) 26,781. Pop. of town (1946) 21,886.

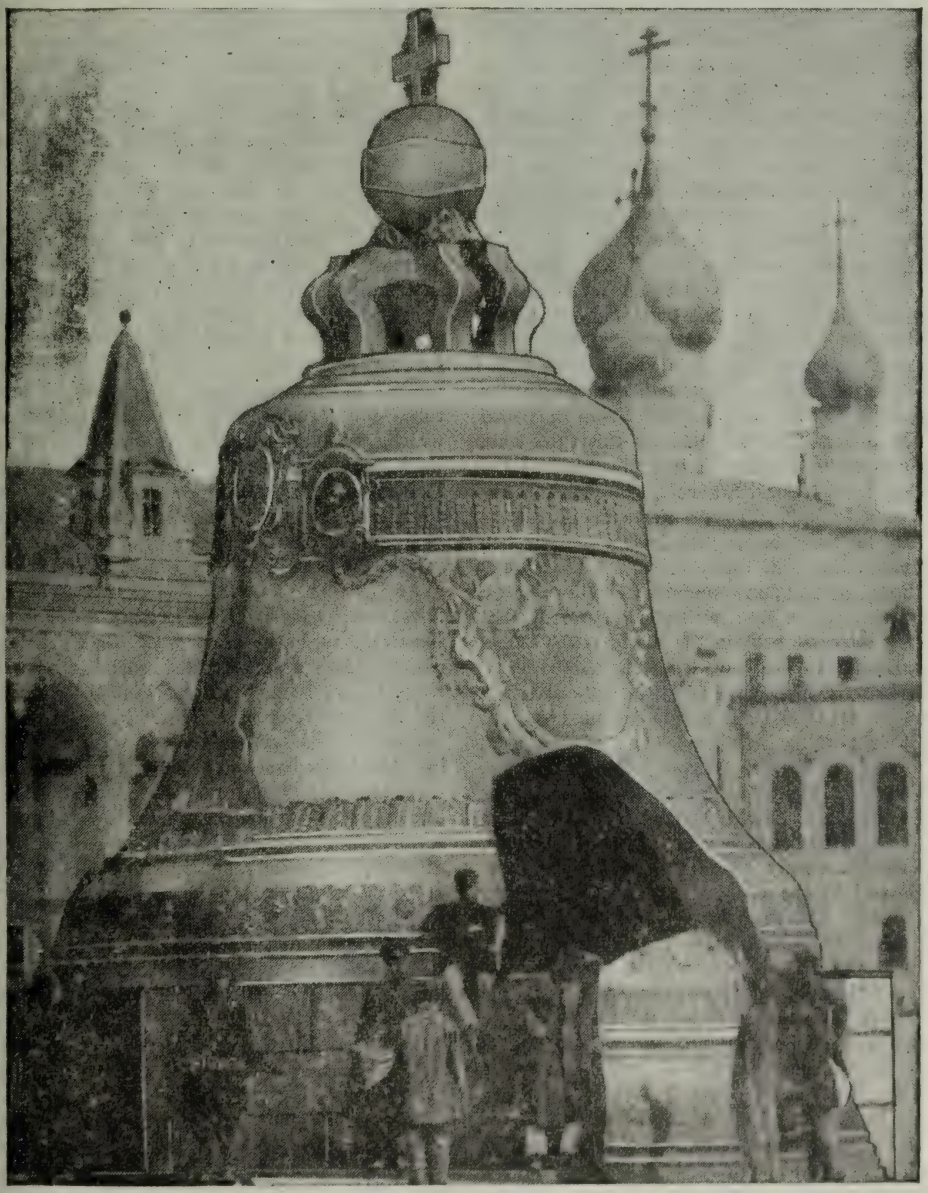
BELKIN, IVAN, pseudonym of the Russian poet Aleksander Pushkin (q.v.).

BELKNAP, JEREMY (1744–98), American clergyman and historian, born in Boston, Mass., and educated at Harvard College. He served as pastor of the Congregational Church, Dover, N.H., from 1767 to 1786, and of the Federal Street Church, Boston, from 1787 to 1798. In 1791 he founded the Massachusetts Historical Society. During the Revolutionary War he supported the cause of independence from Great Britain. After the war he was an advocate of a strong union between the States, and was an opponent of slavery. Among his works are *History of New Hampshire* (3 vols., 1784–92), *Collection of Psalms and Hymns* (1795), and *American Biography* (2 vols., 1792–98).

BELL, a hollow, metallic instrument, nearly always cup shaped, which when struck, usually by means of the clapper or tongue within it vibrates and emits a ringing sound (see BELL RINGING). The term "bell" is applied also to a hollow, metallic sphere sounded by a loose ball in its interior.

Hand bells were used in religious ceremonies

in ancient Egypt, where the feast of the god Osiris was announced by their ringing; in Greece, where hand bells known as *koda* were used in camps and garrisons; and in Rome, where the hours for bathing and for business were announced by means of small, globular bells known as *tintinnabula*. The introduction of the use of bells for services of the Christian church is usually ascribed to Paulinus (353–431), Bishop of Nola, in Campania, Italy, but their extensive use for church purposes seems to have been begun by Pope Sabinianus (d. 606). He ordained that every hour should be announced by the sound of a bell, so that people would be warned of the approach of the canonical hours (q.v.). Church bells were in-



The bell "Czar Kolokol" in Moscow

troduced into France about the middle of the 6th century. The Anglo-Saxon historian Bede mentions that Benedict, Abbot of Wearmouth, England, brought a bell from Italy for his church about 680. Church bells came into use in the Christian churches of the East in the 9th century and in Switzerland and Germany in the 11th century.

Most of the bells first used in western Europe were apparently hand bells. Several examples, some of them, it is believed, dating from the 6th century, still exist in Ireland, Scotland, and Wales. They are made of thin plates of hammered iron, bent into a four-sided form, fastened with rivets, and brazed or bronzed. One bell which is said to have belonged to St. Patrick may still be seen at Belfast. It is called the *Clog-an-eadhachta Phatraic,* or the "bell of St. Patrick's Will". The Irish inscription shows that it was made between the years 1091 and 1105. The four-sided bell of St. Gall, an Irish missionary who died about 646, is still shown in the monastery of the city named for him in Switzerland.

Church bells are suspended either in the steeples or the towers of churches or in special bell towers. The first bells of this type were comparatively small. A bell presented to the church of Orléans, France, in the 11th century weighed about 1¼ tons. From the 13th century on much larger bells were cast. The bell "Jacqueline", in Paris, cast in 1400, weighs about 7½ tons; and the famous bell of Rouen, France, cast in 1501, weighs over 18 tons. One of the largest bells in the world is the "Czar Kolokol", in Moscow, U.S.S.R., cast in 1733. It is 19 ft. high, over 60 ft. in circumference, and 2 ft. thick, and weighs about 180 tons. Other notable bells are a bell of about 80 tons, in a Burmese pagoda; one in Peiping, China, weighing 53 tons; the bell of the Cathedral of Notre Dame, Paris, weighing 17 tons; that of St. Paul's Cathedral, London, weighing nearly 17 tons; and the "Kaiserglocke" in the Cologne Cathedral, weighing 25 tons. The four bells of the Westminster peal in the tower of the Metropolitan Life Insurance building, New York City, weigh 7 tons; the largest of the group weighs almost 4 tons. The largest tuned bell in the world, the bourdon bell which is part of the carillon (q.v.) of the Riverside Church, New York City, weighs 20½ tons.

The material used in making bells is generally a type of bronze known as bell metal, an alloy of copper and tin. Hand bells are often made of brass, antimony alloyed with tin, German silver, silver, and gold. The quality of a bell depends not only on the composition of its metal, but also on the shape of the bell, and on the proportions between its height, width, and thickness.

In founding a bell, first a core is constructed of brickwork. The core is then built up with layers of clay, and, by means of a template or pattern, is shaped to the exact form and dimensions of the interior of the bell to be cast. On this mold is laid a *model* of earth and hair, which is the exact counterpart of the projected bell. A heavy shell is then built over the model. When completed, the shell is lifted and the model is broken away from the core. The outside shell is then put back in place, but between it and the core is left a space the exact size and shape of the model. Into this space the molten bell metal is run and then allowed to cool. After excess parts of the casting are trimmed off, the bell is tuned by paring off metal from its interior.

In recent years, particularly in the United States, so-called tubular bells, consisting of tubes of bell metal suspended vertically from hooks, have been used as chimes. These tubes are struck from above by hammers, usually by a mechanism connected with a clock. The largest tubes for outdoor use are from 8 to 9 feet in length and weigh about 200 pounds. The advantages of tubular chimes include their light weight and the facility with which the striking mechanism can be arranged.

Inasmuch as bells have been intimately connected with the services of the Christian church, they are associated with all sacred rites. As a consequence it has been the custom to dedicate them with religious ceremonies.

Church bells are usually tolled for the dying. Ringing what was called the *passing bell* was originally intended to bid all to pray for the departing soul. The *pardon bell* of pre-Reformation England was tolled before and after divine service, calling worshipers for preparatory prayer before the service and for an invocation for pardon at its close.

The ringing of the *curfew bell,* supposed to have been introduced into England by William the Conqueror, was strictly observed up to the end of the reign (1087–1100) of William II. Its object was to warn the public to extinguish fires and lights at eight o'clock in the evening.

The use of bells in private dwellings began about the end of the 17th century. Such bells were mechanically operated by means of wires passing from one part of the house to another, and were used chiefly to give signals and to

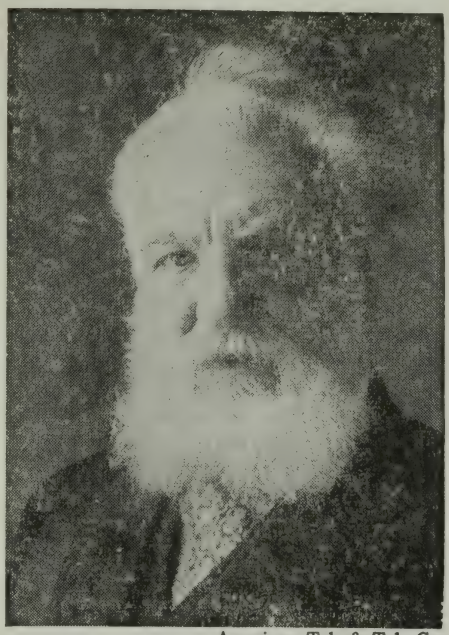
summon attendants. Since the late 19th century, these bells have been replaced by electric bells; in the latter type the clapper is actuated by an electric current flowing through an electromagnet. Electric bells have many modern applications. In addition to their use as call bells and doorbells, they are used in public, commercial, and industrial buildings in signal systems and in fire-alarm and burglar-alarm installations.

BELL, Acton, Currer, and Ellis. See Brontë.

BELL, Alexander Graham (1847–1922), American physicist and inventor, born in Edinburgh, Scotland, and educated at the universities of Edinburgh and London and in Germany. He emigrated to the U.S. in 1871 and became professor of vocal physiology at Boston University; he devoted himself to the teaching of deaf-mutes, and to publicizing the system of "Visible Speech" developed by his father, Alexander Melville Bell. He soon achieved wealth and fame by his invention of the telephone (1876), the photophone (1880), the induction balance (1881), and, in collaboration with others, the graphophone (1883), which resembled the American inventor Thomas Alva Edison's phonograph. He is the author of *Lectures on the Mechanism of Speech* (1906), of many scientific monographs, and of many monographs on the instruction of deaf-mutes.

BELL, Andrew (1753–1832), British clergyman and educator, born in St. Andrew's, Scotland. After a period spent as a tutor in the American colony of Virginia, he returned to England and took orders in the Church of England. In 1789 he became superintendent of an orphan asylum in Madras, India, and there developed the "monitorial system", under which the older pupils instructed the younger. The plan, also known as the Bell or Madras system, was expounded in Bell's pamphlet *An Experiment in Education* (1797). In 1807 the Church of England appointed Bell to organize schools in which his monitorial plan would be applied to religious instruction, and in 1811 made him superintendent of the newly founded National Society for Promoting the Education of the Poor in the Principles of the Established Church. Bell left £120,000 to be devoted to educational purposes. He is buried in Westminster Abbey in London.

BELL, Sir Charles (1774–1842), Scottish surgeon and anatomist, born in Edinburgh, and educated at Edinburgh University. He studied under his brother John and assisted him in anatomical lectures and demonstrations. In 1797 he became a member of the Edinburgh College of Surgeons, and in 1812 a member of the Royal College of Surgeons in London. He served as surgeon at Middlesex Hospital in London from 1812 to 1836, and thereafter as professor of surgery at Edinburgh University.



American Tel. & Tel. Co.

Alexander Graham Bell, the inventor of the telephone, the first electrical instrument successfully to transmit human speech

Bell's contributions to the knowledge of anatomy made him one of the greatest scientists in medical history. He established the existence of motor and sensory nerves, and showed the relations of various nerves to different parts of the brain and to different functions. These discoveries were set forth in several books, of which the most important are *Anatomy of the Brain* (1811) and *The Nervous System of the Human Body* (1830). For these discoveries he was awarded many honors, including the medal of the Royal Society (of which he was a member) in 1829 and knighthood in 1831. Among his other writings is *The Hand: Its Mechanism and Vital Endowments, as Evincing Design* (1834), one of the eight Bridgewater Treatises.

BELLADONNA, Dwale, or Deadly Nightshade, *Atropa belladonna*, a European plant of the Nightshade family, Solanaceae. It is a

herbaceous perennial, from 2 to 6 feet in height, with ovate entire leaves, and bell-shaped flowers of a lurid purple color. It produces berries the size of medium-sized cherries; when ripe, they are shining black in color, and have a sweetish and not nauseous taste, although the whole plant has a disagreeable, heavy odor. All parts of the plant are narcotic and poisonous.

The name "belladonna" (It., "fair lady") is supposed to have originated from the use of the juice for staining the skin or from its use in dilating the pupils and giving a glistening appearance to the eyes. Belladonna is also used in medicine to dilate the pupil in refraction tests. Other applications in medicine include its use as an antispasmodic in asthma and as a cardiac and respiratory stimulant. Its physiological action is due to the poisonous alkaloid, atropine.

BELLADONNA LILY, a species of *Amaryllis, A. belladonna*, with rose-colored, drooping flowers penciled with crimson. A South African plant, it grows well in California, but elsewhere in the U.S. must be grown indoors.

BELLAMY, EDWARD (1850–98), American journalist and author, born in Chicopee Falls, Mass., and educated at Union College and in Germany. In 1871 he became a member of the staff of the New York *Evening Post*. Subsequently he was associated with other newspapers in the northeastern U.S.; he was an editorial writer for the Springfield (Mass.) *Union* and with others established at Springfield the *Daily News*. In 1887 his best-known work, *Looking Backward*, was published. Although it was not written for such a purpose, the book was extensively received as a gospel of socialism, and led to the organization of many Bellamy clubs. *Equality* (1897), the sequel to *Looking Backward*, is an inferior work on similar lines. Bellamy also wrote sociological essays, and some works of fiction.

BELL AND EVERETT PARTY. See CONSTITUTIONAL UNION PARTY.

BELL ANIMALCULES. See VORTICELLA.

BELLARMINE, ROBERT, SAINT (1542–1621), Italian theologian, born in Montepulciano. He entered the order of Jesuits at Rome in 1560. In 1592 he became rector of the Roman College, cardinal in 1599, and in 1602 archbishop of Capua. Bellarmine was the chief defender of the Roman Church in the 16th century. His great work, *Disputationes de Controversiis Christianæ Fidei Adversus hujus Temporis Hæreticos* (3 vols., Rome, 1581), is a clear, uncompromising exposition of Roman Catholic doctrine. He was canonized in 1930, and was declared a Doctor of the Church by Pope Pius XI in 1931. His feast is celebrated May 13.

BELLAY, JOACHIM DU (1522–60), French poet and prose writer, born in Liré. He was, next to Pierre de Ronsard, the most important member of the group of writers known as the Pléiade (see PLEIAD). In his *Défense et Illustration de la Langue Française* (1549) Du Bellay maintained that French prose should be modeled as closely as possible on the Greek and Latin masterpieces, and that the earlier French poetry should be set aside as trivial and poorly organized. The book contributed greatly to the success of the literary revolution which was effected by the Pléiade. His poems include the sonnet sequences *Olive, Les Regrets*, and *Les Antiquités de Rome* (translated by the English poet Edmund Spenser under the title *Ruins of Rome*). His verses give singularly graceful expression to the mood, at once pensive and pleasure-loving, which is characteristic of most writers of the French Renaissance.

BELLBIRD, common name applied to several unrelated birds whose songs suggest the sound of a bell ringing. **1.** The campanero of South America. **2.** Either of two honey eaters, one of Australia, the other of New Zealand. **3.** In some parts of the U.S., the wood thrush.

BELL, BOOK, AND CANDLE, a medieval form of excommunication administered by the Church of Rome. The officiating ecclesiastic pronounced the formula of excommunication, and closed the pronouncing of the sentence by shutting the book from which it was read, taking a lighted candle and casting it to the ground, and tolling the bell as for the dead. This mode of excommunication appears to have existed in the Western churches from the 7th to the 10th century.

BELLEAU, REMI (1528–77), French poet, born in Paris. He was a member of the group of French poets known as the Pléiade (see PLEIAD), and was also a soldier and a courtier. Belleau's writings are picturesque and warm, but superficial. His collections of descriptive and pastoral poetry intermingled with prose include *Petites Inventions* (1557), *Bergerie* (1565), and *Amours et Nouveaux Échanges de Pierres Précieuses* (1576).

BELLEAU WOOD, BATTLE OF, military engagement of World War I, fought between German and American troops on a wooded hill about 5 miles N.W. of Château-Thierry, France. The battle began on June 6, 1918,

when a brigade of U.S. marines, commanded by Brigadier General James Guthrie Harbord, launched an attack on German positions in the forested area. Despite stubborn German resistance, the American offensive developed successfully until June 15. On that date units of the 3rd Infantry Division, American Expeditionary Force, relieved the marines. In the next few days these units, together with units from the 2nd Infantry Division, drove the Germans from their few remaining positions. American casualties totaled more than 7800 officers and men, killed, wounded, and missing. German losses were also severe. In 1923 the French government dedicated the battleground as a permanent memorial to the Americans who died there, renaming it the *Bois de la Brigade de Marine*.

BELLE ISLE, a strait and a virtually uninhabited island between southeastern Labrador and northern Newfoundland. The strait, which connects the Atlantic Ocean with the Gulf of St. Lawrence, is on the shortest route from Europe to the St. Lawrence River. It is about 35 m. long and from 10 to 15 m. wide. It is much used by ocean-going vessels from June until the end of November, although floating ice and fogs make navigation difficult at all seasons. The island, belonging to Newfoundland, is of granite and is 700 ft. high at its highest point. It is in the wide eastern entrance to the strait, nearly 15 m. from either coast, and has a lighthouse at its southern end. Area of the island, about 15 sq.m.

BELLENDEN, BALLENDEN, or **BALLENTYNE,** JOHN (fl. 1533–87), Scottish poet, translator, and ecclesiastic, born in Lasswade, Midlothian, and educated at the universities of St. Andrews and Paris. After a period as a clerk of accounts in the service of James V, King of Scotland, he was appointed, in 1533, archdeacon of Moray and a canon of Ross, and became known for his hostility to the Reformation. With James V as his patron, he translated the first five books of *The Annals of the Roman People* (not published until 1822) by the ancient Roman historian Titus Livius, known as Livy, and *Historia Scotorum* (1527) by the Scottish historian Hector Boece. His translation of Boece's work, published in 1536 as *The History and Chronicles of Scotland*, was characterized by a lusty style and the vigorous use of Scottish vernacular. The *History* also contained two original poems by Bellenden, "The Proheme to the Cosmographe" and "The Proheme of the History".

BELLEROPHON, hero of Greek legend. He aroused the jealousy of the king of Argos, who sent Bellerophon to Iobates, the king of Lycia, with a sealed message asking that the youth be slain. Iobates imposed upon Bellerophon the task of slaying the legendary monster known as the chimera. Mounted on the winged steed Pegasus, with the help of the goddess Athena the hero succeeded in killing the monster. He next was attacked by and defeated the tribe of warlike women known as the Amazons. On his way home he destroyed an ambuscade of Lycians, set by Iobates for his destruction. On his return he married the Lycian princess Philonoe, by whom he had three children. The Greek poet Homer relates that Bellerophon at last drew on himself the hatred of the gods, and the Greek poet Pindar relates that on Pegasus he endeavored to mount to Olympus, but was thrown by his steed, and stricken with blindness. Bellerophon's adventures formed the subject of lost plays by the Greek tragic dramatists Sophocles and Euripedes.

BELLES-LETTRES, in modern usage, designation sometimes applied to esthetic, as distinct from scientific or utilitarian, literature. Specifically, the term is used to denote literary forms which contain artistic, creative writing, such as the drama, poetry, the essay, and the novel. As originally employed, it referred to the humanities in general. The term appeared in the English language in 1710, when the English author Jonathan Swift used it in the periodical the *Tatler*.

BELLEVILLE, county seat of St. Clair Co., Ill., situated in a rich coal-mining region, 14 miles S.E. of St. Louis, Mo. The city is served by three railroads and is an industrial center, with plants engaged in the manufacture of boilers, nails and nail kegs, agricultural implements, mining machinery, shoes, clothing, stoves and ranges, castings, stencils and stencil machines, caskets, seat cushions, corrugated boxes, and a variety of other products. About 8 miles E. of the city is Scott Air Force Base, radio-training center of the U.S. Air Force. Pop. (1950) 32,721.

BELLEVILLE, town of Essex Co., N.J., situated on the Passaic R., 3 miles N. of Newark, of which it forms a suburb. Among the varied manufactures of Belleville are textiles, machinery, wire cloth, and cosmetics. Pop. (1950) 32,019.

BELLFLOWER. See CAMPANULA.

BELLIGERENT, in international law, a government actually at war. A state need not

be politically independent in order to have the status of a belligerent, but it must be capable of maintaining itself by regular hostilities or otherwise under a de facto government. When both parties to the struggle are not sovereign political communities, but one a colony in rebellion against the parent state, or a revolutionary section or party waging war against the general government, unless the conditions are such as to bring about the international recognition of the rebellious party as a belligerent, it has no standing in international law, and its acts of war are technically crimes; for example, its maritime actions fall under the definition of piracy (q.v.). It has no belligerent rights and is not entitled to have its blockades respected nor its vessels received in foreign ports. It is the recognition of an insurgent government as a belligerent by neutral powers which brings it within the protection of the laws of war. But this act must be carefully distinguished from recognition of the independence of the insurgent government.

The grant of belligerent rights to an insurgent government is not an unmixed blessing, even to the recipient, and it carries with it certain benefits to the other party to the conflict. Its principal advantage to the former is the powerful moral support which it gains from international recognition. In addition to this, it acquires the recognition of its flag, the right to negotiate loans abroad, and, in general, a quasi-political status, though without diplomatic standing. On the other hand, the status of belligerency carries with it the obligation to observe the rules of civilized warfare, and it shifts the responsibility for damage caused by the insurgent government to neutral commerce and to the citizens of neutral states from the sovereign party to the party in insurrection. Accordingly, in the American Civil War, Great Britain and France, having recognized the Southern Confederacy as a belligerent power, were unable to charge the Federal government with liability for injuries to their subjects inflicted by the Confederate government or by its citizens in the territory occupied by it; whereas the government of Turkey, which did not recognize the Southern States, was able to hold the United States responsible for the acts of its rebellious citizens.

BELLINGHAM, county seat of Whatcom Co., Wash., on the E. shore of Bellingham Bay, overlooking the San Juan Islands. The city is about 90 miles N. of Seattle and 23 miles S. of the Canadian border. The Olympic and Cascade mountains are visible from Bellingham, and Mount Baker is 60 miles away. The harbor of the city accommodates ocean-going vessels, and is nearer to Alaska and the Orient than any other U.S. central shipping point. Three transcontinental railroads serve Bellingham; the city has also a large airport. The surrounding region is noted for production of timber, fruits, berries, vegetables, dairy cattle, and poultry. It is known also as a summer resort and winter sports center, with excellent facilities for boating, fishing, mountain climbing, and skiing. The principal industries of the city are the canning of salmon and farm produce, coal mining, shipbuilding, and the manufacture of lumber, sulfite pulp, paper products, alcohol, cement, furniture, and iron and steel products. Bellingham is the wholesale and retail trade center of the northwestern counties of Washington. It is the site of the Western Washington College of Education, and is headquarters for the Mount Baker National Forest. Pop. (1950) 34,112.

BELLINGSHAUSEN, FABIAN GOTTLIEB VON, or (Russ.) FADDEI FADDEEVICH BELLINGSGAUSEN (1778–1852), Russian naval officer and explorer, born on the island of Oesel, Livonia. In 1803 he participated in the first Russian circumnavigation of the globe. Beginning July, 1819, with the two corvettes *Vostok* and *Mirny*, he traversed the Antarctic Circle, discovered the island which he named Traversay in December, 1819, and thence penetrated to lat. 70° S., where he discovered and named Peter Island and Alexander Land. He took part in the military operations against the Black Sea port of Varna in 1828 during the Russo-Turkish War (1828–29), was advanced to the rank of vice-admiral, and was placed in command of the Russian Baltic fleet. Afterward he became admiral and military governor of the fortified port of Kronshtadt.

BELLINI, name of a family of Italian painters. **1.** IACOPO BELLINI (1400?–70?), born in Venice. He was a pupil of the Italian painter Gentile da Fabriano. Iacopo Bellini founded the Venetian school of painting (q.v.). Only three paintings signed by him are extant: "Christ Crucified" (in Verona), and two Madonnas (in Lovere and Venice). Sketchbooks of his studies and drawings are in the British Museum and the Louvre. **2.** GENTILE BELLINI (1429?–1507), son of Iacopo, born in Venice. Gentile was noted for his portraits and paintings of pageantry, and for his introduction into Venice of the art of painting

murals in oils. In 1474 he became official painter to the Venetian state. Among his works are the portrait "Caterina Cornaro" (Budapest) and "Preaching of St. Mark" (Brera Museum, Milan). **3.** GIOVANNI BELLINI (1430?–1516), brother of Gentile, born in Venice. Giovanni Bellini was the most important of early Venetian painters. He was a master of the characteristic quality of Venetian painting, nobility of form combined with soft, glowing color; and he was the teacher of Titian, Il Giorgione, and other prominent Italian painters. Giovanni Bellini was noted for his Madonnas, altarpieces, and other devotional paintings. Among his works are "Madonna" (1485–90, National Gallery, London), the altarpiece in the church of San Zaccaria, Venice (1505), and "Madonna and Child with Saints" and "Portrait of a Young Man" (both undated, Metropolitan Museum of Art, New York City).

BELLINI, VINCENZO (1801–35), Italian operatic composer, born in Catania, Sicily, and trained at the Conservatory of Naples. After writing various instrumental and choral compositions, he composed his first opera, *Adelson e Salvini* (1824), the success of which was duplicated by his *Bianca e Fernando*, produced at the San Carlo Opera House, Naples (1826). Bellini was then engaged to write an opera for the Teatro della Scala at Milan. After the presentation of *Il Pirata* (1827), he became one of the most popular composers in Europe, and continued to write successful operas, including *La Straniera* (1828), *Capuleti ed I Montecchi* (1830), *Sonnambula* (1831), *Norma* (1931), and *Beatrice di Tenda* (1833). He settled in Paris, where he devoted himself to the study of French music, diction, and verse, and then composed *I Puritani* (1835), first presented at the Théâtre Italien, Paris. Its success eclipsed that of all his previous efforts. He was preparing another work at the time of his death. Bellini is best known as the composer of *Norma,* the title role of which has been a favorite vehicle for such great singers as Jenny Lind and Lilli Lehmann.

BELLMANN, KARL MIKAEL (1740–95), Swedish lyric poet, born in Stockholm. Bellmann was the son of a professor at the University of Uppsala. He began to write poetry at an early age, often composing the melodies for his songs. His poems express the joy of life and occasionally a coarse revelry, but usually with a cynical or pathetic undertone. His more important works are collected in *Fredmans Epistlar* (1790) and *Fredmans Sånger* (1791).

Metropolitan Museum of Art

"Madonna Adoring the Sleeping Child," painting by Giovanni Bellini

BELLO, ANDRÉS (1780?–1865), Venezuelan writer, born in Caracas. He took a prominent part in politics and among other offices held that of Venezuelan commissioner of war. In 1810 he went to England with the Venezuelan statesmen Simon Bolivar and Lopez Mendez to ask help for the South American insurgents against Spanish rule. Bello later settled in Chile, where in 1834 he was appointed secretary of state, and in 1843, rector of the newly established University of Chile at Santiago. Among his numerous works are *Principios de Derecho Internacional* (1832) and *Gramática de la Lengua Castellana* (1847).

BELLOC, HILAIRE, pen name of JOSEPH HILARY PIERRE BELLOC (1870–1953), English author, born in La Celle, Saint-Cloud, France, of French and English parentage, and educated in England at Edgbaston Oratory School and at Balliol College, Oxford University. In 1902 Belloc became a naturalized British citizen and in 1906 he was elected to Parliament, serving until 1910. He was a prolific writer and his range was wide, including poetry, nonsense verse, essays, novels, travel books, and histories. His political views and his literary works were strongly colored by his patriotism and his Roman Catholic convictions. Among his historical works are *Danton* (1889),

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Hilaire Belloc

Robespierre (1901), *Marie Antoinette* (1910), *The Servile State* (1912), *History of England* (1925–31), *Miniatures of French History* (1925), *Wolsey* (1930), *Cromwell* (1934), *Characters of the Reformation* (1936), *The Great Heresies* (1938), and *Elizabeth* (1942); his books of essays include *On Nothing* (1908), *On Anything* (1910), *On Something* (1910), *This and That* (1912); among his children's books is *Bad Child's Book of Beasts* (1896), which is included in *Cautionary Verses*, an omnibus volume of his nonsense verses (1941); his books on religious subjects include *The Catholic Church and History* (1926) and *How the Reformation Happened* (1928); among his critical works are *Books that Change the World* (1928) and *On the Place of Gilbert Chesterton in English Letters* (1941); important among his travel books is *Places* (1942).

BELLONA, in Roman mythology, the goddess of war, sister or wife of Mars, represented as armed with a bloody scourge. The first temple in Rome dedicated to Bellona was erected in the Campus Martius in 296 B.C. by the consul Appius Claudius. There foreign ambassadors were received by the Senate, and official declarations of war were made.

BELLOWS, a simple machine for blowing a stream of air through an orifice. It was used in earliest times for supplying a draft to a fireplace, and is still used with domestic fireplaces and simple forges.

The most primitive form of bellows consists of an animal skin sewed into a rude bag, with a valve and nozzle attached. A more advanced form, similar to the domestic bellows in use today, consists of two boards hinged together at one end, with a nozzle at the hinged end and a pair of handles at the other end. The boards are connected at the sides and end by pieces of leather to form a collapsible box. Near the handle in one of the boards is a large valve consisting, in its simplest form, of a flap of leather covering the inside of a hole in the board. When the handles are drawn apart, air rushes in through the valve and fills the box; when the handles are pushed together, the valve automatically closes and the air is forced out through the nozzle.

Use of the common bellows is limited by its inability to supply a continuous blast rather than a series of puffs. For stationary installations, such as those supplying a blast for a forge, various types of double bellows have been devised to overcome this limitation. One such device has two collapsible chambers with leather sides, separated by a horizontal, stationary center board. Movable upper and lower boards complete the chambers. The operator moves the lower board up and down by means of a lever. The lower chamber acts in the same way as ordinary bellows, delivering puffs of air through a valve to the upper chamber. A large weight on the upper board causes a constant pressure in the upper chamber, with the consequent delivery through the main nozzle of a more regular stream of air than the simple bellows can produce.

BELLOWS, George Wesley (1882–1925), American landscape, genre, and portrait painter, born in Columbus, Ohio, and trained in New York City under the American artists William Chase, Kenneth Hayes Miller, and Robert Henri. In 1918 and 1919 he was an instructor at the Art Students League, New York City, and also in 1919 at the Art Institute, Chicago. His work is characterized by breadth and boldness of handling. Among his best-known paintings are "Up the Hudson" (Metropolitan Museum of Art, New York City), "North River" (Pennsylvania Academy of Fine Arts, Philadelphia), "Club Night" (privately owned), and "Forty-Two Kids" (Corcoran Gallery, Washington, D.C.). In addition, his work is represented in the galleries of Brooklyn, Toledo, and Cincinnati, and in others of note throughout the United States.

BELL RINGING, the art and science of playing on a set of musical bells. It is part of the broader science of campanology, which

deals also with the casting and tuning of bells (see BELL), and with their suspension (see BELL TOWER). See also CARILLON. This article discusses bell ringing as practiced only on large bells such as church bells and bells in bell towers.

Bell ringing is accomplished either by hand, by mechanical means, or by electricity. Ringing by hand is commonly done by means of a rope attached to the bell; the pulling of the rope by the ringer causes the bell to move so that the clapper within strikes the side of the bell. Sometimes the rope is attached to the clapper and the bell is rung by pulling the clapper; this method of ringing is called "clocking" a bell. If the clapper, by either method of ringing, strikes the side lightly, producing a slight sound, the process is known as "chiming". When the bell is moved sufficiently to produce a loud sound, the process is called "ringing". In mechanical ringing, the bell is generally struck on the outside by hammers attached to wires operated by clock machinery or by handles arranged in a keyboard. In electric ringing, wires lead from a console to large magnets connected with the bell clappers. When a key on the console is pressed, an electric current is transmitted to a magnet which pulls the clapper against the side of the bell. Rapidity of playing is made possible by means of electric operation.

The music played upon bells by the methods described above consists either of tunes or of *changes*. Among the tunes are hymns, national anthems, and other melodies. When a set of bells is rung in an order proceeding from the "treble" or highest note to the "tenor" or lowest note, the bells are said to be rung in "rounds". Any variation in this order of ringing the set is known as a *change*. Change ringing is not usually done on fewer than five bells or more than twelve. The number of changes that can be rung varies from 120 on 5 bells to 479,001,600 on 12 bells.

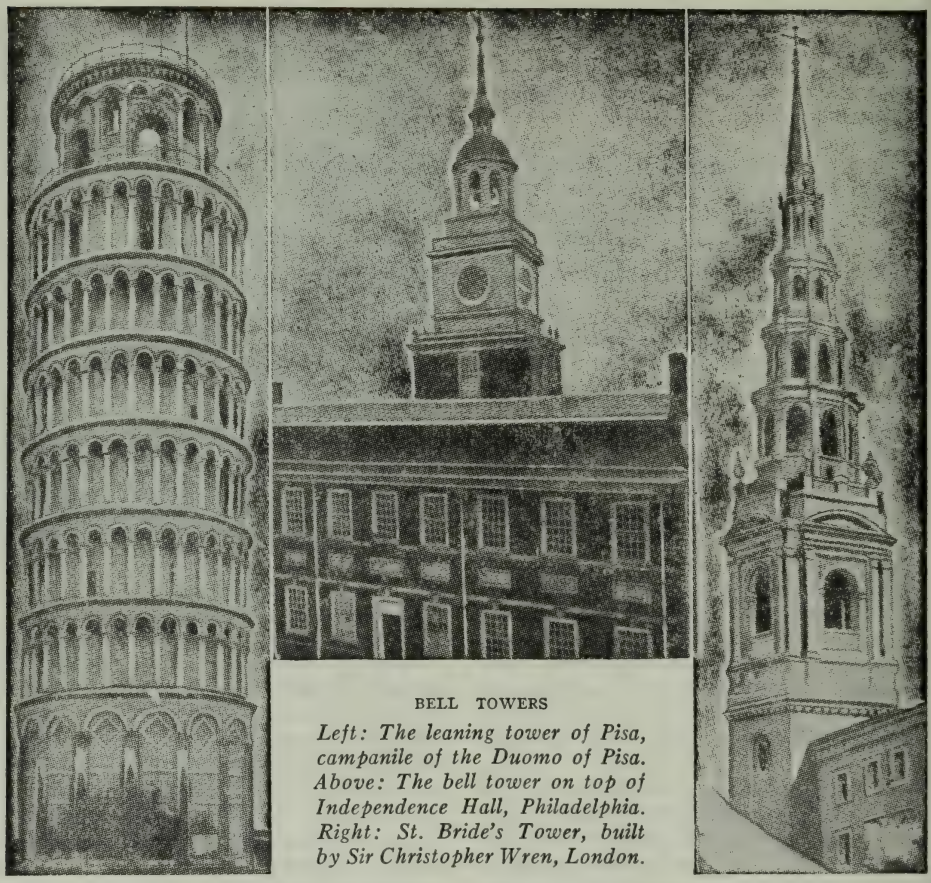
Change ringing was known in England possibly as early as the 16th century; however, according to *Tintinnalogia* (1668), the first known work on the subject of change ringing, the practice did not originate until the beginning of the 17th century. In the second half of the 18th and the first half of the 19th centuries, the art of bell ringing was neglected; but in the second half of the 19th century a revival of interest in the art brought about an improvement in the making and care of bells and in the status of bell ringers. In modern times change ringing is practiced mainly in England, and to some extent in Australia, South Africa, Canada, and the United States. Bell ringing in general is widely practiced on the European continent and in the United States.

BELL ROCK, or INCHCAPE, a reef of old red sandstone rocks in the North Sea, 12 miles S.E. of Arbroath, Scotland, and opposite the mouth of the Tay R. According to tradition, the abbot of Aberbrothock (Arbroath) placed a bell on it, which rang continually, being "moved by the sea, giving notice to the saylers of the danger". This legend was repeated by the poet Robert Southey in *The Inchcape Rock*. A lighthouse, 120 ft. in height, was erected on the spot (1807–10).

BELL TOWER, a tower, part of either a religious or civic structure, or standing apart from such a structure, built for the purpose of containing one or more large bells. The tower standing separately was prevalent in Italy and was known as a *campanile*. In medieval days the term *belfry*, which today means the wooden frame for the bell or bells in a bell tower, or the entire part of the structure containing the bell or bells, was applied to the entire bell tower.

Medieval bell towers were designed not primarily to house bells, but as watch towers. The Romanesque (about 800-about 1200) and the Gothic (about 1150-about 1450) periods in Europe produced numerous bell towers, often the most finished examples of Romanesque and Gothic architectural style. During these periods the pinnacled spire was the chief characteristic of the bell towers of northern and western Europe; and the square, brick bell tower, or campanile, flat-topped or crowned with a square pyramid of moderate height, was typical of Italy. In Italy during the Renaissance the building of campaniles or bell towers declined, but in northern and western Europe the art still flourished. Typical of the Renaissance bell towers were those erected by the architect Sir Christopher Wren in England. The bell towers of the Colonial churches in America were designed on Renaissance models.

The earliest examples of the isolated bell tower or campanile, erected in Ravenna, Italy, in the 5th century, to adjoin the basilicas of St. Apollinaire Nuova and St. Apollinaire in Classe, were circular in shape. From the 8th century on, however, the square-shaped campanile prevailed. Notable campaniles are the campanile of the church of San Gottardo, Milan (12th century); the famous leaning tower of Pisa (q.v.), erected in 1174, which is the campanile of the Duomo of Pisa; the



BELL TOWERS

Left: The leaning tower of Pisa, campanile of the Duomo of Pisa. Above: The bell tower on top of Independence Hall, Philadelphia. Right: St. Bride's Tower, built by Sir Christopher Wren, London.

campanile of St. Mark's cathedral, Venice (begun in 874, completed 1150); and that of the Duomo at Florence, designed by the Florentine artist Giotto in 1335 and later completed by the Florentine architect Taddeo Gaddi and others. Many campaniles are of great height. That of Florence is 275 feet high, and that in Venice is 320 feet high.

Modern examples of campanile construction are the Victoria Tower of the Westminster Houses of Parliament, London; the tower of the church of Sacré-Cœur, Paris; the campanile of the municipal group of buildings in Springfield, Mass.; the memorial tower at Brown University, Providence, R.I.; and the campanile of the University of California, Berkeley, Calif.

BELLUNO (anc. *Bellunum*), capital of a province of the same name in northeastern Italy, at the confluence of the Piave and Ardo rivers, 72 miles N. of Venice. From 1420 to 1797 the town belonged to the Venetian Republic. Its chief manufactures are silk, straw, leather, and wax; its trade is principally in silk, lumber, wine, and fruit. Area of province, 1419 sq.m.; pop. (1936) 216,333. Pop. of town (1936) 10,083.

BELO HORIZONTE, capital of the State of Minas Gerais, Brazil, about 210 miles N. of Rio de Janeiro. The city is the center of a region containing rich gold, iron, and manganese mines, and cotton fields. In the town diamonds are cut and cotton is milled. One of Brazil's eight universities is located there. Since Belo Horizonte was built in the last years of the 17th century to become the capital of the State, replacing Ouro Preto, it has rapidly increased in size and importance; it is now Brazil's second-largest inland city. Pop. (1950) 338,585.

BELOIT, city of Rock Co., Wis., on both sides of Rock R., about 85 miles N.W. of Chicago, Ill. General farming, dairying, and stock raising are carried on in the surround-

ing region. Industries in the city include woodworking, and the manufacture of papermaking and grinding machines, Diesel engines, power pumps, machine tools, shoes, hosiery, and building and carton paper. Beloit was founded in 1836 by a group of New England immigrants, and it received a city charter in 1856. It is the site of Beloit College, a coeducational, liberal arts institution founded in 1846, and is noted also as a winter sports center. Pop. (1950) 29,590.

BELPHEGOR, originally BAAL PEOR, in the Old Testament, a god of the Moabites (q.v.), and regarded as a demon or evil spirit. In medieval demonology, Belphegor is an arch demon. In the *Novella* (1469) of the Italian writer Niccolo Machiavelli, Belphegor is sent from hell by the god Pluto to the city of Florence to take a wife. After a short marriage Belphego flees back to hell rather than endure his wife's insolence any longer. The story is told also in one of the *Fables* of the French author Jean de La Fontaine.

BELSHAZZAR, Babylonian prince noted in the Old Testament (Daniel 5) as the last Chaldean king of Babylon, slain at the capture of the city by the Medes and Persians. No ancient historian mentions his name as one of the successors of Nebuchadrezzar, but the Babylonian cuneiform inscriptions gave the name Belsar-uzar as that of the son of Nabonidus, the last king of Babylon (558–538 B.C.), and one of his later inscriptions gives ground for the inference that the son was associated with his father on the throne.

BELTRAFFIO or **BOLTRAFFIO,** GIOVANNI ANTONIO (1467–1516), Italian painter of the Lombard school, born in Milan, and trained under the Italian artist Leonardo da Vinci. Many of his paintings are in the galleries of Milan and Bergamo. Among the best examples are the "Madonna with the Vase of Flowers" in the Poldo-Pezzoli Collection, Milan; the "Madonna Casio" in the Louvre, Paris; the "Resurrection of Christ", wrongly attributed to Leonardo da Vinci, in the Berlin gallery; "La Belle Ferronière", also once attributed to Leonardo, in the Louvre; and the "Lady with the Weasel", at Cracow.

BELTRAMI, EUGENIO (1835–1900), Italian mathematician, born in Cremona. He taught mathematical physics at the University of Rome and several other Italian universities, and played a conspicuous part in laying the foundation of modern geometry. The Lincei, a celebrated academy of Rome, honored Beltrami by electing him president. Important among his essays is the monograph "Saggio de Interpretazione della Geometria non-Euclidia", published in the *Giornale di Matematico di Napoli* (1868). Besides his work in pure mathematics, his original contributions to mathematical physics include papers on electricity, magnetism, and elasticity.

BELUGA, or WHITE WHALE, a mammal of the dolphin (q.v.) family, closely related to the narwhal. The body of the adult is about 10 ft. long, and is remarkable for its creamy-white color and for the absence of a dorsal fin, which is represented only by a slight ridge. The flippers are short; the head is arched, and sinks abruptly to the short, rounded snout. It is a gregarious animal, associating in droves of both sexes. Belugas feed on fishes, which they often follow far up rivers. They are fearless, sportive animals, and have been successfully kept in aquariums. They are found throughout the seas of the Arctic Regions, and often as far south as the St. Lawrence R.

BELUGA STURGEON. See STURGEON.

BELZONI, GIOVANNI BATTISTA (1778–1823), Italian explorer and archeologist, born in Padua. He settled in London, and in 1815 he went to Egypt to construct a hydraulic engine for the viceroy, Mehemet Ali, to raise the waters of the Nile River. There he began the exploration of Egyptian antiquities. In 1817 he cleared away the sand from the entrance to the great rock-hewn temple of Abu-Simbel, and in the same year discovered the tomb of Seti I at Thebes. This, the finest of the royal tombs, became known as "Belzoni's tomb". At Giza he found (1818) the entrance to the pyramid of Khafre, King of Egypt, and made the first thorough examination of the great pyramids. He also explored the desert between the Red Sea and the Nile and visited the oasis of Siwa.

In 1819 he returned to Italy and thence to England, bringing a valuable collection of antiquities; among them were the splendid alabaster sarcophagus of Seti I (now in the Kensington Museum) and the upper half of a colossal statue of Rameses II (now in the British Museum). Two years later he wrote his *Narrative of Operations and Recent Discoveries.* In 1823 he set out to explore the interior of West Africa, and died on the journey to Timbuktu.

BEMBEX. See SAND WASP.

BEMBO, PIETRO (1470–1547), Italian scholar, born in Venice. After six years at the court of the duke of Urbino, in 1512 he went to Rome, and was made secretary to Pope Leo X; in 1539 he was made a cardinal by Pope

Paul III. Bembo became historiographer of Venice and curator of St. Marks Library in 1529. He is credited with bringing about the 16th-century triumph of classic tradition in the Italian language, and the creation of a style, written in imitation of the Italian poet Petrarch's poetry, known as *bembism*. His influence on Italian literature, art, and social life was felt for three centuries. His works include *Prose della Volgar Lingua* (1525) and *Rerum Veneticarum Libri xii.* (1551).

BEMELMANS, LUDWIG (1898–), American author and illustrator, born in Meran, Tirol, Austria, and educated in Bavarian schools. He emigrated to the United States in 1914, and acquired citizenship in 1918, while serving in the U.S. Army. For some ten years he was employed in restaurants of the Ritz-Carlton Hotel, New York City, first as bus boy and then as assistant manager of the banquet department. His two works *Life Class* (1938) and *Hotel Splendide* (1939) are based on his experiences during this period. Among his other writings, all of which are for the most part satirical and humorous, are *My War with the United States* (1937), *Small Beer* (1940), *Rosebud* (1942), *Now I Lay Me Down to Sleep* (1943), *Dirty Eddie* (1947), *Father, Dear Father* (1953), and *To the One I Love the Best* (1955). Bemelmans is also well known for his juveniles, among which are *The Golden Basket* (1935), *Madeline* (1939), *Fifi* (1940), *Madeline's Rescue* (1953), and *Madeline and the Bad Hat* (1957). He illustrated most of his own works, and his paintings are included in the collections of the Metropolitan Museum of Art, New York City, the Houston (Texas) Museum, and the Detroit (Mich.) Museum.

BEMIS HEIGHTS. See SARATOGA, BATTLES OF.

BENADRYL, a synthetic chemical compound which has the property of preventing the physiological reactions produced by histamine (q.v.). Because the development of symptoms of allergy is connected with the presence of histamine in the bloodstream, benadryl is administered to prevent the development of allergic symptoms in such conditions as hives and other allergic skin disorders. See ALLERGY.

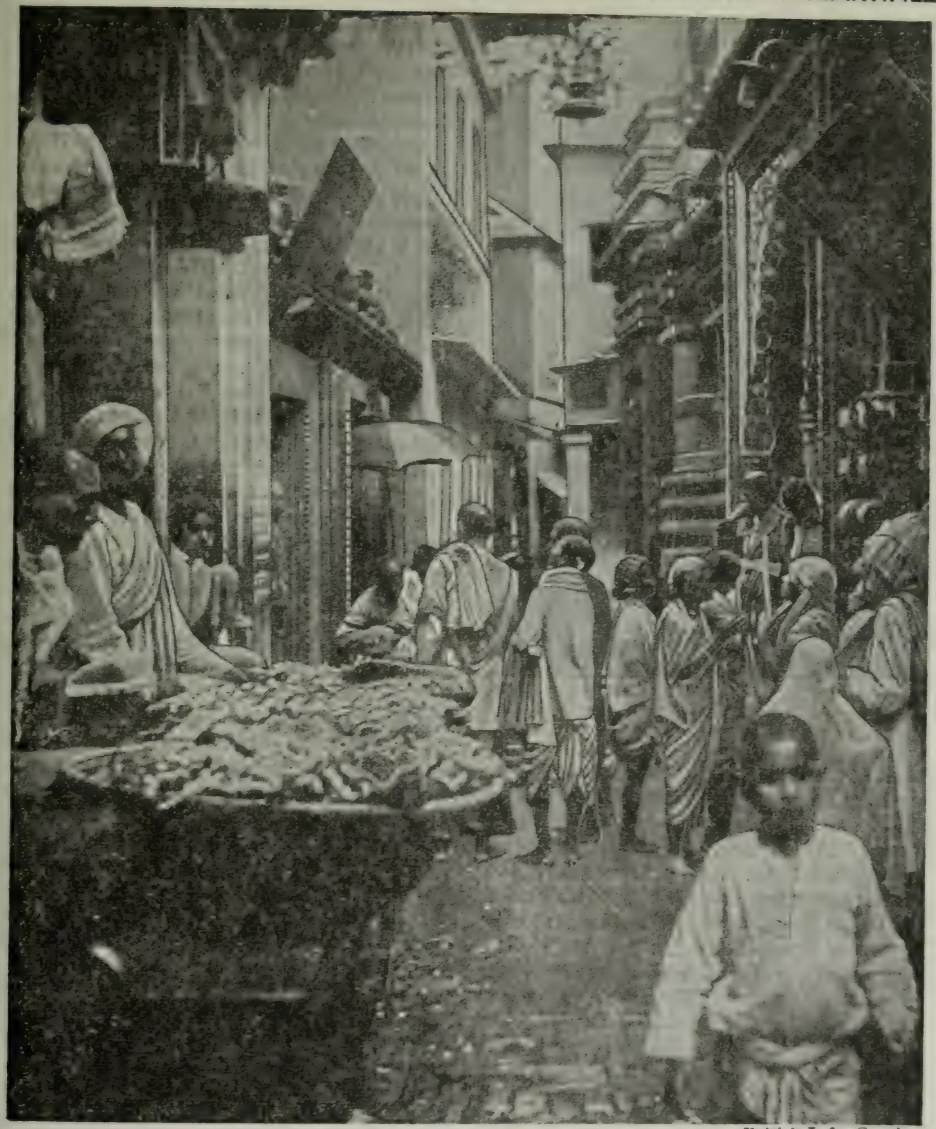
BEN-AMI, JACOB (1890–), American actor, born in Minsk, Russia. In 1918, the year of his emigration to the United States, he appeared at the Yiddish Art Theater, New York City. In 1920 he appeared in his first English-speaking role, in *Samson and Delilah*, at the Greenwich Village Theater, New York City. In 1926 he directed *Goat Song* for the Theatre Guild. From 1929 to 1931 he was connected with the Civic Repertory Theatre (New York City), headed by the American actress and producer Eva Le Gallienne, and appeared in *The Sea Gull*, *The Cherry Orchard*, *Camille*, and other plays. Later plays in which he appeared included *A Ship Comes In* (1934) and *Three Cities* (at the Yiddish Art Theater, 1938).

BENARES, former princely state of India, now forming part of Uttar Pradesh State (United Provinces of Agra and Oudh), Union of India. Constituted in 1911 from the family domains of the maharajah of Benares, the state was in political association with Gwalior Residency, British India, until the termination (1947) of British paramountcy in India. Ramnagar (pop. in 1941, 12,953), a town on the Ganges R. opposite the city of Benares, is the former capital. Area of former state, 866 sq.m.; pop. (1941) 451,428.

BENARES, officially BANARAS, city and capital of the district of the same name, Uttar Pradesh State (United Provinces), Union of India, situated on the N. bank of the Ganges R., about 400 miles W.N.W. of Calcutta.

The city has few buildings built before the late 16th century, but its site was occupied in antiquity by the Sanskrit *Kasi*, and to devout Hindus the city has always existed. It is to them the holiest of cities; Hindu pilgrims come to Benares from all parts of the world. Records of such pilgrimages date from the 7th century. Benares is crowded at every season with worshipers in its temples. Large throngs gather along the banks of the sacred Ganges River, where terraced landings, or *ghats*, lead down to the water. Hindus believe that immersion in the Ganges water cleanses them of sins, and that death on its banks leads to salvation. The level portions of the ghats are used for funeral pyres.

From Ramnagar, across the river, the city of Benares gives an impression of splendor which is dissipated on closer view. The narrow streets wind circuitously between painted and carved buildings, many of them with overhanging galleries. Among the temples, over 1500 in number, the best known are the mosque of Aurangzeb; the observatory of Raja Jai Singh, and the Durga temple, both built in the 17th century; and the holiest of all temples, the Bisheshwar, or Golden Temple. Benares is also a center of learning, especially for the study of Sanskrit, centered at Benares College, founded in 1791 and maintained by the government. Benares Hindu



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Hindus gathered at the doorway of a temple in the city of Benares, India

University, established in 1916, was the first denominational university in India under private control.

In the European section w. of the native city are located government buildings, including the Government College and the Prince of Wales' Hospital. Benares is also an important commercial center. Silk brocade, gold and silver thread, filigree work, and brass articles are manufactured in the city.

The district of Benares lies in the valley of the Ganges R., in the eastern part of Uttar Pradesh State. Benares is a fertile, level region producing sugar cane, grains, and pulse. Area of district, 1960 sq.m.; pop. (1951) 1,978,634. Pop. of city (1951) 355,777.

BENAVENTE Y MARTÍNEZ, JACINTO (1866–1954), Spanish playwright and critic, born in Madrid, and educated at the University of Madrid. After the publication of a

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Robert Benchley

book of his verse in 1886, he attracted public attention with a critical work, *Letters of Women* (1893), and a comedy, *Other Birds' Nests* (*El Nido Ajeno,* 1894). A number of his plays attack social climbers, the wealthy, and feudal institutions. In 1922 he was awarded the Nobel Prize for literature; subsequently he toured Spanish America and the United States with a company performing his works. In addition to plays for children, he wrote many comedies and tragedies, including *La Otra Honra* (1924), *Alfilerazos* (1924), *La Mariposa que Voló Sobre el Mar* (1926), *El Hijo de Polichinela* (1927), *El Demonio Fué antes Ángel* (1928), and *El Pan Comido en la Mano* (1934). Many of his plays have been translated into French, Italian, and English; among those translated into English are *Saturday Night* (1903), *The Bonds of Interest* (1907), *Brute Force* (1908), *The Passion Flower* (1913), *The Fabricated Truth* (1933), and *At Close Range* (1936).

BENCHLEY, Robert Charles (1889–1945), American humorist, editor, and actor, born in Worcester, Mass., and educated at Harvard University. From 1912 to 1914 he was a member of the editorial staff of the Curtis Publishing Company, and subsequently joined the staff of the New York *Tribune* (1916–1917), and the magazines *Vanity Fair* (1919–20), *Life* (1920), and *The New Yorker* (1920–40). Among his works are *Of All Things* (1921), *Love Conquers All* (1921), *Pluck and Luck* (1925), *The Early Worm* (1927), *The Treasurer's Report* (1930), *From Bed to Worse* (1934), *After 1903, What?* (1938), *Inside Benchley* (1942), and *Benchley Beside Himself* (1943). He wrote many motion-picture scripts, and was a notable motion-picture actor. *How To Sleep,* which he wrote, directed, and played in, won the Academy of Motion Picture Arts and Sciences award for the best short subject of the year in 1935.

BENDERABBAS. See Bandar Abbas.

BENDIGO, formerly Sandhurst, city of the State of Victoria, Commonwealth of Australia, about 80 miles N.N.W. of Melbourne. It is the center of a mining district containing rich alluvial deposits of gold, discovered in 1851. Earthenware, bricks, and beer are manufactured in the city, and an important trade is carried on in fruit and vegetables grown in the surrounding area. Pop. (1952 est.) 32,850.

BENDS, in popular usage, name denoting the acute disease known medically as aeroembolism and caused by rapid decrease of the atmospheric pressure. It is characterized by small bubbles or swellings under the skin, but its most striking symptom is excruciating pain, usually spread over many parts of the body. The victim is likely to double up in agony; this characteristic symptom gives the disease its name. Temporary paralysis of some part of the body may also occur, and sometimes permanent damage or even death may result. The disease is known also as caisson disease, decompression sickness, and diver's disease.

The disease was first observed in 1820 and soon became familiar to divers and caisson workers who had to work for long periods in compressed-air chambers. The symptoms appeared when those affected were brought back to ordinary atmospheric conditions. The only known cure was to put the victim immediately back into a pressure chamber and then to lower the pressure very slowly to normal. The cause of the symptoms was not known, although it was suspected that they were due to the liberation of air bubbles inside the blood stream and body tissues after a quick decompression.

During World War II airplanes were constructed which would climb within 6 minutes to 30,000 ft., where the atmospheric pressure is less than ⅓ normal. Such rapid decompression could easily result in the aviator being

stricken with bends, and so an intensive study of the disease was undertaken. It was found that bubbles of air liberated in the blood vessels block some of the small terminal vessels, cutting off the blood supply of nerve endings and thus giving rise to the symptoms. Of the gases in the blood, oxygen and carbon dioxide are readily reabsorbed, so that nitrogen is the chief offender. The disease can therefore be prevented or made much less severe by having the aviator breathe pure oxygen not only during his flight, but for some time before it commences. In this way the nitrogen is eliminated from his system. This process is necessary only for interceptor pilots who fly very rapidly to very high altitudes. In transport aircraft, equipped for long-range flight at high altitudes, the cabin is pressurized to control the drop in atmospheric pressure.

BENEDICITE, or SONG OF THE THREE CHILDREN, a canticle from the Old Testament (Dan. 3), forming part of the prayer of Abednego in the fiery furnace. It was sung in the Christian Church as early as the 4th century, and is used in the Anglican Church at the morning service when the *Te Deum* is not sung.

BENEDICT, name of fifteen popes, among whom were the following. **1.** BENEDICT VIII (d. 1024), pope from 1012 to 1024. He was born in Rome, and was the son of Count Gregory of Tusculum and the brother of Pope John XIX. He was a layman before his election as pope. After his election, he was driven from Rome by an antipope, Gregory, but was restored to the papal chair in 1014 with the aid of King Henry II of Saxony, whom he crowned Holy Roman emperor. Benedict VIII distinguished himself as a reformer of the clergy, and interdicted, at the synod of Pavia (1022), both clerical marriage and concubinage. **2.** BENEDICT IX (about 1012–56), pope from 1032 to 1044, in 1045, and 1047–48. He was the nephew of Pope Benedict VIII, and obtained the papal throne by simony in 1032, at the age of twenty. His dissolute character aroused much indignation, and in 1044 a Roman faction drove him from office as unfit to rule. He later reinstated himself, then resigned in favor of Gregory VI, but regained the papal throne again in 1047, at the death of Clement II, who had succeeded Gregory VI. In 1048 he was again driven from Rome. **3.** BENEDICT XIII (1649–1730), pope from 1724 to 1730. He was born in Gravinia, Naples, as Pietro Francesco Orsini. He became a Dominican in 1667 and was created a cardinal in 1672. He was a learned man, and as pope instituted various reforms, which, however, were largely ineffective. In diplomatic affairs he yielded to unscrupulous advisers who took advantage of their trust. **4.** BENEDICT XIV (1675–1758), pope from 1740 to 1758. He was born in Bologna as Prospero Lambertini. He became a cardinal in 1728, and archbishop of Bologna in 1731. As pope, he encouraged commerce and agriculture, instituted various reforms, and, in his bulls and encyclicals, regulated mixed marriages, settled controversies regarding Indian and Chinese rites, and revised the Roman Martyrology. He greatly encouraged education and science, founding the chairs of physics, chemistry, and mathematics at the University of Rome, and reviving the academy of Bologna. In literature, he caused the best English and French books to be translated into Italian. His most important works are *On the Diocesan Synod, On the Sacrifice of the Mass,* and *On the Beatification and Canonization of Saints.* **5.** BENEDICT XV (1854–1922), pope from 1914 to 1922. He was born in Pegli, Italy, as Giacomo della Chiesa. He was ordained as a priest in 1878 and later served as undersecretary to Cardinal Rampolla in Madrid, Spain. He was created archbishop of Bologna in 1907 and elevated to the cardinalate in May, 1914. Two months after the outbreak of World War I, he was elected pope. Benedict XV was an unassuming head of the Roman Catholic Church, a sincere patron of arts, and, as his handling of the diplomatic situation at the Vatican during the war proved, a subtle statesman. Throughout the struggle, he made frequent efforts to bring about a peace settlement. During his rule, official relations were restored between the Vatican and the French government, and a British representative was sent to the Vatican for the first time since the 17th century. His circulars were published in eight parts (1915–23), and in 1917 he promulgated the new *Codex Juris Canonici.*

BENEDICT, RUTH FULTON (1887–1948), American anthropologist, born in New York City, and educated at Vassar College and Columbia University. She joined the faculty of Columbia University in 1923, and served as a professor after 1930. Her most important field work, performed during periods of leave from Columbia, was done on trips which she made to the reservations of various American Indian tribes between 1922 and 1939. From 1943 to 1946 she was granted an extended leave in order to serve with the Bureau of Overseas Intelligence of the Office of War Information. Ruth Benedict was a recognized authority on the ethnology of the American Indians; she earned also a wide popular reputation through

her work as a cultural anthropologist. Her works include *Patterns of Culture* (1934), *Zuñi Mythology* (2 vols., 1935), *Race: Science and Politics* (1940), and *The Chrysanthemum and the Sword: Patterns of Japanese Culture* (1946).

BENEDICTINES, monks and nuns following the rule of St. Benedict of Nursia. The first twelve Benedictine monasteries were founded at Subiaco, near Rome, by Benedict, who later founded the famous abbey at Monte Cassino (q.v.), and there established the rule that organized and revitalized Western monasticism and gave it its particular characteristics. Judged by the standards of the time, the Benedictine rule imposed no great amount of austerity or asceticism. It required the provision of adequate food, clothing, and shelter for the monks. Dependent upon the season of the year and the festival celebrated, the monks' day was divided into four to eight hours for the celebration of the divine office (see BREVIARY), seven to eight hours for sleep, and the remainder about equally divided between work (usually agricultural) and religious reading and study. The abbot was given full patriarchal authority over the community, but was himself subject to the rule, and was required to consult the members of the community on important questions. During the lifetime of Benedict, his disciples spread the order through the countries of central and western Europe, and it soon became the only important order in those lands, and remained so until the founding of the Austin Friars (see AUGUSTINIANS) in the 11th century and of the mendicant orders in the 13th century.

Gregory the Great was the first of fifty Benedictines who have occupied the papal throne; others were Leo IV, Gregory VII, Pius VII, and Gregory XVI. St. Augustine, the disciple of Gregory the Great, brought the Benedictine rule to England, and became the first of a long list of Benedictine archbishops of Canterbury. As early as 1354 the order had numbered 24 popes, 200 cardinals, 7000 archbishops, 15,000 bishops, 1560 canonized saints, and 5000 holy persons worthy of canonization, a number since increased to 40,000. It had included 37,000 monasteries, 20 emperors, 10 empresses, 47 kings, 50 queens, and an immense number of royal and noble persons. In the 15th century there were 15,107 Benedictine monasteries. The Reformation left not more than 5000. During the present century the order has spread in the United States, where there are several large abbeys and a number of smaller establishments.

The Benedictine habit consists of a tunic and scapular, over which is worn a long full gown called a *cowl*, with a *hood* to cover the head. The color is not specified in the rule, and it is conjectured that the early Benedictines wore white, the natural color of undyed wool. For many centuries, however, black has been the prevailing color, whence the term "black monk" has come to mean a Benedictine.

See also MONASTIC ART.

BENEDICTION, a formal invocation of the divine blessing upon men or things. Benedictions were specified in the Jewish ritual by the Hebrew lawgiver Moses (Num. 6:24–26) and have been used by the Jews in public worship since that time, especially on certain holy days. The Christian Churches made benedictions important parts of their services. In the Roman Catholic Church, the most solemn form is Benediction of the Blessed Sacrament, in which a priest or bishop makes the sign of the cross over the congregation with a monstrance or ciborium containing the consecrated Host. This rite grew out of the custom, popular in the 14th century, of exposing the Host for public adoration. Less solemn benedictions are given by making the sign of the cross with the right hand, while invoking the blessing of the Holy Trinity. The hand is held with the first three fingers extended, symbolizing the Trinity, and the fourth and fifth fingers flexed together, representing the two natures of Christ. These practices are also followed in the Anglican and Greek churches. In most Protestant churches, the benediction is pronounced with the hands extended, or simply, without any gesture.

BENEDICT OF NURSIA, SAINT (480?–543?), Italian prelate, born in Nursia (Norcia), near Spoleto. At the age of fourteen he retired to an uninhabited area near a lake, called *Sublaqueum* (now Subiaco). There, in a cavern (which afterward received the name of the Holy Grotto), he dwelt for three years, until his fame spread over the country, and multitudes came to see him. Benedict founded twelve monasteries near Subiaco, and later founded the monastery of Monte Cassino, and another at Terracina. In 515 he is said to have composed his *Regula Monachorum*, which by its wide adoption as a monastic rule earned him the title of "Founder of Western Monasticism". See BENEDICTINES.

BENEFICE (Lat. *beneficium*, "favor"), a term now used chiefly in England to denote an ecclesiastical preferment or living. It has no reference to the dignity of office of the in-

cumbent, but describes the beneficial property right enjoyed by him by virtue of his office. The right to appoint a curate or vicar to a benefice is in itself a species of property. Some benefices are called *exempt* or *peculiar*, meaning that they are not under the ordinary control of the bishop. Such benefices are, nevertheless, so far as relates to pluralities (i.e., the holding of more than one benefice) and residence, subject to the archbishop or bishop of the diocese.

BENEFIT OF CLERGY (*privilegium clericale*), in English criminal law, a privilege accorded to the clergy and afterward extended to all who could read, by which one who had been convicted in a secular court of some felony, less than treason, could claim a hearing before the bishop's court, on his own declaration of innocence, in arrest of judgment. If not actually in holy orders, the convict was branded on the left hand in the brawn of the thumb if he was discharged by the bishop's court. Whipping and fines were afterward substituted for the branding. Among the earliest enactments of the first Congress of the United States (1790) was an act forbidding "benefit of clergy", which had previously been recognized in the colonies of Carolina and Virginia. It was completely abolished in England in 1827.

BENEKE, Friedrich Eduard (1798–1854), German philosopher, born in Berlin, and educated at the universities of Halle and Berlin. In 1832 he was appointed extraordinary professor of philosophy at the University of Berlin. Beneke's system of psychology was empirical, and his method of development inductive. His works include *Neue Grundlegungen zur Metaphysik* (1822) and *Pragmatische Psychologie* (2 vols., 1850).

BENELLI, Sem (1877–1949), Italian playwright and poet, born in Prato in Toscana. He was one of the best-known Italian playwrights of his time, particularly for his historical plays in verse. Benelli's finest play is generally considered to be *La Cena delle Beffe* (1909), which was made into an opera by the Italian composer Umberto Giordano, and was produced in New York City after World War I both as an opera and a play under the title *The Jest*. Benelli also wrote the opera libretto *L'Amore dei Tre Re*, "The Love of the Three Kings" (1909), which he rewrote as a play in 1930. Though he is the author of poetry (*L'Aetare*, 1916) and a prose book descriptive of World War I (*Parole di Battaglia*, 1918), Benelli wrote mostly for the stage. Among his many plays in prose or verse are *L'Amorosa* (1925), *Il Vezzo di Perle* (1926), *Con le Stelle* (1927), *Fiorenza* (1930), *Adama ed Eva* (1932), *Caterina Sforza* (1934), *L'Elefante* (1937), *Proserpina* (1938), and *La Mia Leggenda* (1939).

BENELUX, a customs union between Belgium, the Netherlands, and Luxembourg, which went into effect on January 1, 1948. The name is a combination of the first few letters of the names of the three countries. The customs union was planned as early as 1946, one year after World War II, in order to encourage economic co-operation and formulate uniform customs schedules among the three member nations. However, postwar export and import controls, particularly in the Netherlands, hindered the realization of the union's purposes. Its main historical importance lay in the increasing tendency of the member nations to act as a unit in diplomatic negotiations with such countries as France, Great Britain, and the United States.

BENEŠ, Eduard (1884–1948), Czechoslovak statesman, born in Kožlany, Bohemia (now in Czechoslovakia), and educated at the universities of Prague, Paris, and Dijon.

Acme

Eduard Beneš

From 1909 to 1912 he was professor of economics at the Prague Academy of Commerce. During this period he met and became a disciple of the Czech statesman and nationalist leader Tomáš Garrigue Masaryk, and from 1915 to 1918, as editor of the Paris newspaper *La Nation Tchêque*, he was associated with Masaryk in the movement for an independent Czechoslovak state. In 1918, on the creation of the modern state of Czechoslovakia (see CZECHOSLOVAKIA: *History*), Beneš became the new nation's first foreign minister. In 1919–20, he acted as chief of the Czechoslovak delegation to the Paris Peace Conference which followed World War I, and in 1920 was a cofounder of the political and economic alliance between Czechoslovakia, Romania, and Yugoslavia known as the Little Entente (q.v.). Beneš held the post of prime minister as well as that of foreign minister from 1921 to 1922, and was a member of the Council of the League of Nations from 1923 to 1927; he also was professor of sociology at the University of Prague from 1922 to 1938.

In 1935 Beneš was elected president of Czechoslovakia. Three years later, however, after the conclusion of the Munich Pact (q.v.), by which the sections of Czechoslovakia known as the Sudetenland were ceded to Germany, he resigned his office, and in October, 1938, settled temporarily in England. He was appointed professor of sociology at the University of Chicago, in the United States, in 1939, but after the outbreak of World War II he returned to England, where he became president of the Czechoslovak government in exile. Beneš returned to Prague in May, 1945, after his country's liberation. He was reelected president of Czechoslovakia in 1946 for a seven-year term. The postwar period witnessed the increasing control of the Czechoslovak government by communist elements, culminating in the spring of 1948 with a communist seizure of complete power. In June, 1948, a new Czechoslovak constitution was adopted under communist auspices, confirming the communist dictatorship, and Beneš resigned. He died about three months later. Beneš' writings include *The Spirit of the Czechoslovak Revolution* (1923), *My War Memories* (1928), and *Democracy—Today and Tomorrow* (1939).

BENÉT, STEPHEN VINCENT (1898–1943), American poet and novelist, born in Bethlehem, Pa., and educated at Yale University. He was the brother of William Rose Benét. His works are highly imaginative and show an absorbing interest in the American scene. While a student at Yale, he wrote two books of poetry, *Five Men and Pompey* (1915) and *Young Adventure* (1918). Among his other works are the volume of poetry *Heavens and Earth* (1920); the novels *Young People's Pride* (1922), *Jean Huguenot* (1923), and *Spanish Bayonet* (1926); *John Brown's Body* (1928), a narrative poem of the Civil War, for which he received the Pulitzer Prize; *The Devil and Daniel Webster* (1937), one of the best American short stories, later made into the motion picture *All That Money Can Buy* and into a libretto for a folk opera with the original title; and *Western Star* (1943), an unfinished narrative poem. He was also noted for his radio dramas, which include *Listen to the People*. In 1938 he was elected a member of the American Academy of Arts and Letters.

BENÉT, WILLIAM ROSE (1886–1950), American poet, critic, and editor, born in Brooklyn, N.Y., and educated at Yale University. In 1923 he married the American poet Elinor Wylie. His poetry, generally romantic, is noted for its variety of form and subject. He was associate editor of the *Literary Review* of the New York *Evening Post* from 1920 to 1924, when he became one of the editors of *The Saturday Review of Literature*. He is the author of *Merchants from Cathay* (1913); *The Falconer of God* (1914); *The Burglar of the Zodiac* (1918); *Moons of Grandeur* (1920); a novel, *First Person Singular* (1922); *Wild Goslings* (1927); *Man Possessed* (1927); *With Wings as Eagles* (1940); *Air Ballads* (1940); and *The Dust Which Is God* (1941), an autobiographical poem for which he received the Pulitzer Prize for poetry. He is coeditor of the *Oxford Anthology of American Literature* (1938), *Twentieth Century Poetry* (1938), *Poetry for Modern Youth* (1938), *Poems for Freedom* (1945), and *The Stairway of Surprise* (1947).

BENEVENTO, capital of a province of the same name, Campania, Italy, situated on a hill between the Calore and Sabbato rivers, about 34 miles N.E. of Naples. The town is an archiepiscopal see. Its original name, as chief town of the Samnites in the 4th century B.C., was *Maleventum* ("ill wind"). Several years after the Roman victory (275 B.C.) there over King Pyrrhus of Epirus, its name was changed to *Beneventum* ("fair wind"). In the 6th century A.D. the Lombards made it the capital of an independent duchy. From 1053 until the establishment of the modern Italian state in 1860, Benevento belonged to the Papal States, except during the years from 1806 to 1815,

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Grocer's shop in a small village in Bengal

when it was the capital of a principality granted to the French statesman Charles Talleyrand-Périgord by Emperor Napoleon I. On the north side of the town is the famous memorial arch of the Roman emperor Trajan (*Trajan's Column*), dedicated in 114 A.D.; the reliefs show the emperor's life and his triumphs in the Dacian campaigns (101–06 A.D.). Grain is traded in the town and gold and silver-plated ware, leather, and parchment are manufactured. The province, midway between the Gulf of Naples and the Gulf of Manfredonia, is agricultural. Area of province, 796 sq.m.; pop. (1936) 303,235. Pop. of town (1951) 47,449.

BÉNÉZET, SAINT. See BRIDGEBUILDING BROTHERHOOD.

BENGAL, in physical geography, a region of the subcontinent of India, bounded on the N. by Sikkim and Bhutan, on the E. by Assam and Burma, on the S. by the Bay of Bengal, and on the W. by Bihar. In political geography the region is occupied by West Bengal, a State of the Union of India, and East Bengal, a province of Pakistan. Prior to the establishment (1947) of the Dominion (later Union) of India and the Dominion of Pakistan, Bengal was almost entirely coextensive with the province of the same name, British India. The remainder of the region was occupied

by the princely states of Cooch Behar and Tripura, both on the Assam border. Calcutta (q.v.), former capital of the British Indian province of Bengal, is the chief city; other important cities include Howrah and Dacca (qq.v.). The total population of the region is about 75 percent nonurban. Mohammedans, a majority of the inhabitants of East Bengal, and Hindus, a majority in West Bengal, native Christians, Buddhists, Sikhs, Jains, and Parsees comprise the principal religious groupings. The principal language, Bengali, is spoken by more than 90 percent of the people; over seventy-five other languages, however, are also spoken.

Except for the mountainous north comprising a part of the Himalaya, and the hill ranges along the east and west, Bengal is a great alluvial plain, intersected by many rivers. In their course through Bengal the Ganges and Bramahpútra rivers bear the names Padma and Jamuna, respectively. These great rivers with their tributaries furnish an easy and cheap means of transportation, but more important, from their high Himalayan sources they bring down and distribute over the surface of their combined delta the rich silt that makes Bengal one of the most extraordinarily fertile farming regions of India.

The climate of Bengal is tropical, and unhealthful, except during the cool season lasting from November to February. Moist winds sweeping northward from the Bay of Bengal produce a high degree of humidity. The mean yearly temperature ranges from 80° F. to 75° F. Rainfall is heavy, averaging from 50 in. to 75 in. in the western, southwestern, and central portions, and from 75 in. to 120 in. elsewhere, except in the mountain region of the north, where this is greatly exceeded. During the rainy season, lasting from June to October, river floods and cyclones from the Bay of Bengal are not uncommon. In 1876 a cyclone accompanied by a tidal wave caused the death of 100,000 persons. In more recent times the cyclone of 1937, accompanied by a huge tidal wave and the inundation of the Hooghly River, a channel of the Ganges, killed 300,000 persons.

More than three fourths of the people of Bengal are engaged in agriculture. The chief crop is rice, the principal food of the people. Other important crops include jute, tea, the opium poppy, sugar cane, beans, chinchona, tobacco, oil seeds (rape, mustard, linseed), cotton, grains, silk, mulberry, and spices. Formerly large areas were devoted to the growing of indigo, but because of the cheapness of the synthetic product indigo cultivation is no longer important. Minerals mined in Bengal are chiefly coal, iron, and salt. Industrial establishments in the region include jute mills and cotton mills. The manufacturing industries, however, have not kept pace with the agricultural development of the country. Many of the native industries, such as the manufacture of dyes and the finer silks, as well as minor articles of general consumption, have almost disappeared, and the local demand for these articles is supplied largely by British and other manufacturers. The decline of native industries is due largely to the development of railway transportation, which has enabled the machine-made goods of the Western world to compete with the local, hand-made articles.

The great bulk of the trade passes through Calcutta. Imports are chiefly cotton goods, metals, mineral oil, and machinery. Exports include jute manufactures and raw jute, drugs (opium), oil seeds, and rice. Besides the internal communication afforded by the many rivers and about 3500 miles of railroad, there are in the region about 2500 miles of canals, over 8000 miles of paved roads, and 86,000 miles of unpaved roads.

Institutions of higher learning include Calcutta University, established in 1857; Dacca University, established in 1921; and colleges and other schools for training in the arts and professions, including engineering. Bengal has about 3500 secondary schools.

Bengal was constituted a presidency in 1699, sixty-six years after the arrival of the British. After a series of changes in territorial and political structure it became in 1937 an autonomous province with a bicameral legislature. In 1945, however, under the Government of India Act (1919), the administration was taken over by the British governor.

In 1947, on the achievement of the independence of India and the division of that country into the dominions of India and Pakistan, Hindu and Moslem states, respectively, the western and smaller portion of former Bengal Province, including Calcutta and Howrah, became part of India, and the eastern portion, including Dacca, became part of Pakistan. The line of division between the new provinces of East Bengal and West Bengal runs from slightly east of the Himalayan resort of Darjeeling to slightly east of Calcutta.

Area of the region of Bengal (including

Cooch Behar and Tripura), 82,812 sq.m.; pop. (1941) 60,306,525.

BENGAL, BAY OF, a portion of the Indian Ocean, lying between the Indian Peninsula, on the W., and Burma and the Malay Peninsula, on the E. The bay receives many large rivers: the Ganges and the Brahmaputra on the north; the Irrawaddy on the east; and the Mahanadi, the Godavery, the Krishna, and the Cauvery on the west. On the west coast of the bay the harbors are poor, but on the eastern side are many good ports, such as Akyab, Gwa, Moulmein, and Tavoy. The islands in the bay include the Andaman, Nicobar, and Mergui groups.

BENGALI LANGUAGE AND LITERATURE. Bengali is one of the seven great Aryan vernaculars of India, spoken mainly in the basin of the lower Ganges River. It is a modern Indian dialect, akin to Uriya, Assamese, Bihari, and Hindustani. Like all modern Indian languages, it is analytic in type, and the structure of its grammar thus resembles that of modern Persian or English. Bengali is spoken by over 56,000,000 people. Its characters are derived from the Devanagari or Sanskrit alphabet.

Impetus was given to Bengali literature by the translation, in the 15th century, of Hindu epics known as the *Mahabharata* and the *Ramayana*. The modern period of Bengali literature is marked by the struggle of the opposing schools, the one inspired by the Sanskrit classics and the other in sympathy with European ideals. Several novels have been produced under European influence in Bengali, and in 1913 the Bengali poet Rabindranath Tagore received the Nobel Prize for literature, indicating a quickened interest in Bengali literature on the part of European audiences.

BENGASI, BENGAZI, or **BENGHAZI,** seaport of Libya, North Africa, on the E. coast of the Gulf of Sidra. It is on the site of the ancient city of Hesperides, which rose to some importance during the 3rd century B.C. under the Egyptian king Ptolemy III, who named it *Berenice* for his wife. Bengasi was occupied by the Italians in 1911, during the Turko-Italian War, and was thereafter part of Italian Libya. The city changed hands several times during the North African campaigns of World War II. It was taken by the British early in February, 1941, lost to the Germans and Italians on April 3, and retaken on Dec. 24. In January, 1942, the Axis Powers took it, but again lost it to the British on Nov. 21, 1942. Next to Tripoli, Bengasi is the chief port in Libya. Barley, corn, livestock, wool, and sponges are among the principal exports. Imports are chiefly cotton and woolen goods, coal, and iron. The city has a considerable caravan trade with the interior. Pop. (1951 est.) 62,300.

BENGUELA or **BENGUELLA,** seaport town and capital of the administrative district of the same name, Angola (Portuguese West Africa). The district is heavily forested, and generally mountainous, with a series of terraces extending inland from the coast. A number of streams and rivers, notably the Cuvo River, flow through the region toward the Atlantic Ocean. The soil is fertile, yielding various types of tropical fruit, wild coffee, tobacco, and vegetables. Mineral deposits in the district include lead, silver, gold, copper, and sulfur. Numerous species of African wild life, including elephants and lions, abound in the forests. The town of Benguela, founded in 1617 by the Portuguese, is located beside a shallow harbor on Lobito Bay. It is connected by rail with Lobito, a port with modern shipping facilities 20 miles N., and with various points in the interior. The chief exports are coffee, ivory, rubber, and minerals. In the 19th century the town was a leading slave depot, through which about 20,000 slaves annually were exported to Brazil and Cuba. Pop. of district (1940) 1,100,104; pop. of town (1940) 14,243.

BEN-GURION, DAVID (1886–), Israeli statesman, born in Plonsk, Poland, and largely self-educated. He became a Zionist (see ZIONISM) at an early age and, in 1906, he emigrated to Palestine, then under Turkish rule, becoming active in the socialist labor movement there. Exiled by the Turks during World War I because of his pro-Allied sympathies, Ben-Gurion went to the United States. Later he helped organize the Jewish Legion of American, British, and Palestinian Jews, which fought against the Turks in the Holy Land. After the war, when Palestine had become a British mandate, Ben-Gurion became a founder of the Vaad Leumi or National Council of Palestinian Jews. In 1933 he became a member of the executive body of the Jewish Agency, which was recognized by the British government from 1929 as the official spokesman for the Jews of Palestine. He was elected chairman of the Agency in 1935 and served in that capacity for many years. In 1947 he pleaded the cause of an independent Jewish state before the United Nations and incurred much criticism from

more militant advocates because of his acceptance of the plan of the United Nations to partition Palestine. On May 15, 1948, following the termination of the British mandate over Palestine, and in implementation of the United Nations' decision to partition the Holy Land, Ben-Gurion became prime minister of the provisional government of the newly created republic of Israel. He was prime minister of the first elected Israeli government from January, 1949, to December, 1953, when he resigned. In February, 1955, he became defense minister, and in November also reassumed the post of prime minister.

BENI AMER, group of Hamitic tribes of N.E. Africa. With the Bisharin and Hadendoa they form the Beja tribes (qq.v.), which inhabit the Anglo-Egyptian Sudan between the Nile R. and the Red Sea, and the northern part of Eritrea. The Beni Amer occupy the S.E. part of this region, forming an important part of the population of Eritrea. A peaceable people, they are mostly nomadic shepherds, speaking a Semitic language called Tigre. In physical characteristics the Beni Amer are, more than any other people, similar to the very early Egyptians.

BENI, EL, department of Bolivia, occupying the northeastern part of the country. Natural resources include vast rubber forests, valuable timber and deposits of gold. Cacao, coffee, sugar cane, tobacco, and tropical fruit are grown. Most of the inhabitants are Indians. Trinidad is the capital. Area, 82,435 sq.m.; pop. (1950) 119,770.

BENI HASAN, village of Egypt, on the E. bank of the Nile R., about 75 miles N. of Asyût. It is noted for the rock-hewn tombs, thirty-nine in number, excavated in the low hills which rise in that part of the valley. The tombs are sepulchers of the monarchs of the Middle Empire (about 2000 B.C.), and their numerous inscriptions form an important source of information on the history of the XIIth dynasty. Population of the village (1947) 4879.

BENI-ISRAEL, native Jews of India, living principally in Bombay Province. They claim descent from the traditional survivors of a shipwreck over 1600 years ago and were mentioned by the Italian traveler and author Marco Polo in the 13th century. Though they are strict observers of the Sabbath and acknowledge the law of Moses, they conform in many respects to the religious customs of the Hindus.

BENI-MZÂB, tribe of Berbers (q.v.) living in the French colony of Southern Territories, Algeria, Africa. They peacefully inhabit the northern regions of the Sahara Desert. The tribe numbers about 30,000.

BENIN, capital of a province of the same name, Western Provinces, Nigeria, British West Africa. The town is about 150 miles E. of Lagos, and is situated on the Benin R., which flows into a part of the Gulf of Guinea called the Bight of Benin. From the 15th century, when the Portuguese first penetrated the region of the lower Niger R., until the late 19th century, Benin was a powerful Negro kingdom with influence over the entire territory from the upper Niger to the Congo R. Its culture was marked by great skill in ivory carving. European influence, especially Portuguese, Dutch, and English, consisted mainly in organization of a vast slave market in Benin territory. The religious practices of the people, particularly human sacrifice, resulted in armed intervention by the British and, in 1914, the incorporation of the region as a province of British Nigeria. Rice and yams are grown in the fertile soil. The principal trade of the province is in palm oil, timber, rubber, and ivory. Oil and timber are exported. Area of province, 8627 sq.m.; pop. (1931) 459,906. Pop. of town (1931) 8530.

BENI SUEF, capital of a province of the same name, Upper Egypt, on the W. bank of the Nile R., about 65 miles S. of Cairo. It is the center for distribution and export of the produce of the fertile valley of nearby Faiyûm Province. The chief industry of the town is cotton milling. Area of province, 423 sq.m.; pop. (1947) 612,027. Pop. of town (1947) 57,106.

BENITOITE, gem mineral consisting of barium titanium silicate, with hardness 6.5 and sp.gr. 3.6. It is deep blue in color (almost colorless when viewed from certain angles) and surpasses the sapphire in fire, but is of less value as a gem because of its greater softness. Its crystalline form is of special interest because its discovery confirmed theoretical computations of the possibility of a new class of crystals in the hexagonal system. Benitoite is named for San Benito County, California, where it was discovered in 1907.

BENJAMIN, in the Old Testament, the youngest and most beloved of the sons of Jacob. He was the eponymous founder of the Israelite tribe of Benjamin, whose warriors were noted for their skill in archery, and for their cleverness in the use of the left hand. The tribe's territory lay on the west side of the Jordan R., between the tribes of Ephraim

and Judah. Saul of Tarsus, who later became the Apostle Paul, belonged to this tribe.

BENJAMIN, Asher (1773–1845), American architect, born in Greenfield, Mass. He made an independent study of Grecian, Roman, and English architectural designs and synthesized the best features of each into a style of building marked by individuality, simplicity, and beauty. His first published book and the first of its kind in America, *The Country Builder's Assistant* (1797), is replete with detailed plans and practical instructions for builders. It influenced considerably the design of homes built throughout northeastern United States during the period following the Revolutionary War. Houses built according to plans by Benjamin, many of which may still be observed in the New York and New England countryside, are characterized by graceful proportions, fluted pilasters, classical doorways surmounted by fanlights, and other decorative features, such as fretwork and guilloches. Benjamin also wrote *The Practical House Carpenter* (1830).

BENJAMIN, Judah Philip (1811–84), American lawyer and statesman, born in St. Croix, West Indies, and educated at Yale University. He practiced law in New Orleans, La., and early engaged prominently in politics, serving first with the Whigs, and afterward with the Democrats. He was a member of the United States Senate from 1852 until Louisiana's secession from the United States in 1861. He then resigned his post to become attorney general in the cabinet formed by Jefferson Davis as president of the Confederate States of America. During the Civil War Benjamin also served as secretary of war for the Confederacy, and later was secretary of state until Davis' capture in 1865, when he escaped with some difficulty to England. He began to practice law in England the following year, was appointed a queen's counsel in 1872, and until his retirement in 1881 was considered one of the most prominent and learned members of the English bar. His *Treatise on the Law of Sale of Personal Property* (1883), better known as *Benjamin on Sales*, was regarded as a legal classic in England.

BENNETT, (Enoch) Arnold (1867–1931), English editor, novelist, playwright, and essayist, born in Hanley-in-the-Potteries (one of the "Five Towns" made famous by his writings), and educated at Newcastle Middle School and at the University of London. For a time he was editor of a woman's magazine, but after 1900 he devoted himself entirely to writing. Bennett is best known for his novels. *Anna of the Five Towns* (1902), *The Old Wives' Tale* (1906), *Clayhanger* (1910), *Hilda Lessways* (1911), and *The Matador of the Five Towns* (1912) are psychological studies of commonplace people living in dingy manufacturing towns. In 1913 four books by Bennett were published: *The Old Adam*, considered one of the notable novels of the year; *Your United States* and *Paris Nights*, based on his travels; and *The Plain Man and His Wife*, an amplified essay. Of his plays, two were performed in New York City with success: *Milestones*, in 1912, and *The Great Adventure* (a dramatization of his novel *Buried Alive*) in 1913. Some of his later works are the novels *A Great Man* (1915), *Over There: War Scenes on the Western Front* (1915), *Mr. Prohack* (1922), *Riceyman Steps* (1923), *The Strange Vanguard* (1928), and *Imperial Palace* (1930); and the plays *The Title* (1918), *Judith* (1919), *Sacred and Profane Love* (1919), *The Love Match* (1922), and *The Return Journey* (1928).

BENNETT, Floyd (1890–1928), American aviator, born near Warrensburg, N.Y. He enlisted in the aviation corps, U.S. Navy, in 1917, and became an instructor in aviation mechanics at the U.S. naval base at Hampton Roads, Va. In 1922 he was transferred to Norfolk, Va., where he met the American explorer Richard E. Byrd. Bennett piloted the plane in which Byrd flew across the North Pole in 1926, and was chosen by Byrd as second in command of a projected flight to the South Pole. Injuries prevented Bennett from accompanying Byrd, and upon recovery he flew from Detroit, Mich., to Lake St. Agnes, Quebec, to aid the crew of a transatlantic airplane stranded on Greenly Island. He contracted pneumonia during the flight, and died soon after his return.

BENNETT, James Gordon (1795–1872), Scottish-American journalist, born in Newmills, Banffshire, Scotland, and educated for the Roman Catholic priesthood. In 1819 he emigrated to Halifax, Nova Scotia, and later moved to Boston, where he became a proofreader for the *North American Review*. About 1826 he settled in New York City, and there he worked on the staffs of various newspapers.

On May 6, 1835, from a cellar at No. 20 Wall Street, he issued the first number of the New York *Herald*. In the *Herald* he included the first Wall Street financial article printed in any newspaper in the United States. He obtained the transmission by telegraph of the

first speech ever thus reported in full—that of the American statesman and orator John Caldwell Calhoun on the Mexican War. His trenchant editorials made enemies for Bennett, but increased the circulation of his paper. His chief aim, however, was the collection and dissemination of current news, and during the Civil War he maintained an extra staff of sixty-three correspondents at an expense for four years of $525,000. He continually added new specialties to his newspaper. In doing so he made the *Herald* at the time of his death the most important and most valuable newspaper property in the United States.

BENNETT, James Gordon (1841–1918), American newpaper publisher and sportsman, son of the Scottish-American journalist James Gordon Bennett, born in New York City, and educated privately abroad. In 1872 he inherited his father's newspaper the New York *Herald* and, although he directed its policies chiefly by cable from his residence in Paris, he maintained its world-wide reputation for complete and accurate news coverage. Bennett also founded the New York *Evening Telegram*, and for some time published a London edition, and later a Paris edition, of the *Herald*. In 1869 Bennett commissioned the American explorer Henry Morton Stanley to find the Scottish explorer David Livingstone (qq.v.). In order to combat the existing cable monopoly, with the American financier John W. Mackay, he founded in 1884 the Commercial Cable Company. For more than half a century Bennett maintained an interest in sports, especially yachting. He donated the James Gordon Bennett cups as trophies for international yacht races, balloon races, and airplane races.

BENNETT, James van Benschoten (1894–), American penologist and public official, born in Silver Creek, Chautauqua Co., New York, and educated at Brown and George Washington universities. In 1926, while employed by the Federal civil service as an investigator in the field of personnel administration, Bennett was directed to undertake a study of the employment program of the Federal prison system. His investigations developed into a broad study of Federal penal policies, and in 1929, after the submission of his report, he was appointed an assistant director of prisons for the Federal government. After 1937 he served as director of the Federal Bureau of Prisons. During the period following World War II he also acted as head of the Prisons Branch of the American Military Government in Germany. Bennett's writings include articles, for various periodicals, on prisons, criminal law, and such penological subjects as parole and probation.

BENNETT, Richard Bedford Bennett, 1st Viscount (1870–1947), Canadian statesman, born in Hopewell, New Brunswick, and educated at Dalhousie University, Halifax, Nova Scotia. In 1911 he was elected to the Canadian House of Commons from Calgary. In the following years he held a number of political offices, becoming leader of the Conservative Party in 1927 and prime minister in 1930. In the latter year he also became a member of the Imperial Privy Council of the British Commonwealth of Nations. When his party was defeated in the general election of 1935, Bennett resigned as prime minister, but continued as leader of the Conservative Party until 1938. In the following year he retired from politics. He later lived in England, where he was created 1st Viscount Bennett in 1941.

BENNETT, Wendell Clark (1905–1953), American archeologist and ethnologist, born in Marion, Indiana, and educated at the University of Chicago. He was assistant curator of anthropology at the American Museum of Natural History, New York City, from 1931 to 1938, and in the latter year became associate professor of anthropology at the University of Wisconsin. He became associate professor of anthropology at Yale University in 1940, and full professor in 1945. He was a member of many archeological expeditions to Latin American countries, including Bolivia (1932, 1934), Peru (1936, 1938, 1946), Colombia (1941), and Ecuador (1944). He wrote monographs on the results of his expeditions, and *The Tarahumara* (with the American ethnographer and archeologist Robert M. Zingg, 1935).

BENNINGTON, BATTLE OF, engagement of the American Revolutionary War, fought near the village of Bennington, Vt., on August 16, 1777. General John Burgoyne, on his march south from Canada to join the British forces in New York City, sent 800 Hessian dragoons and Indians, under Colonel Friedrich Baum, to capture the American supply base at Bennington. Detachments of the New Hampshire militia, led by General John Stark, decisively defeated the British forces, including reinforcements dispatched by General Burgoyne after the battle had begun. British casualties were 207 killed and wounded, and 600 men taken prisoner. American casualties were 14 killed and 42 wounded.

BENNINGTON COLLEGE, a college for women, located in Bennington, Vt., founded in 1932 by a group interested in progressive education. The college offers a four-year academic course leading to the Bachelor of Arts degree; the course may be completed in less time by specially qualified students. Fields of study are the natural sciences; the social sciences; political economy and history; literature and the humanities; the performing arts of drama, music, and dance; the visual arts of painting, sculpture, and architecture; and the graphic arts. The college year is divided into two four-month terms at college and a three-month term of nonresident work In 1952–53 enrollment was 334, including 325 full-time students, and the faculty consisted of 51 persons.

BENNY, Jack, original surname Kubelsky (1894–), American actor, born in Waukegan, Ill., and educated at the public schools of that city. After a successful career in vaudeville, in 1929 he became a motion-picture actor. Among numerous pictures in which he appeared are *The Meanest Man in the World, George Washington Slept Here,* and *Love Thy Neighbor.* In 1932 Benny became a radio entertainer; he is the producer and leading actor of the comedy radio show, the *Jack Benny Show.* He began to appear regularly on television in 1950 on the *Jack Benny Show.*

BENOÎT DE SAINTE-MAURE, or Sainte-More (fl. 12th cent.), French troubadour, born in Sainte-Maure, Touraine. Attached to the court of King Henry II of England, in 1160 he composed the *Roman de Troie,* a poem of about 30,000 lines in which the story of the Trojan War was recounted as if it had occurred in the writer's lifetime, the characters behaving in conformity with contemporary feudal customs and standards. In the *Roman* was told for the first time in literature the story of Troilus and Briseida (Cressida) from which the Italian writer Giovanni Boccaccio and the English poet Geoffrey Chaucer drew material for poems and on which the dramatist William Shakespeare based his play *Troilus and Cressida.* Benoît is also the reputed author of *Chronique des Ducs de Normandie,* a poem of about 45,000 octosyllabic verses eulogizing the Plantagenet dynasty. A modern edition of the *Chronique* in three volumes was published in 1836–44; of the *Roman,* in 1904–12.

BENONI, town of Transvaal Province, Union of South Africa, about 25 miles s.e. of Pretoria. Benoni is the center of a rich gold-mining district. Pop. (1951 prelim.) 36,675.

BENSON, town of Johnston Co., N.C., situated about 30 miles s. by e. of Raleigh It is served by a railway and lies in a region noted for the production of bright-leaf tobacco. Ice making, woodworking and the manufacture of shirts and lumber are the town's leading industries. Benson is the site of the State Annual Singing Convention, held on the fourth Saturday and following Sunday of each June. Between 20,000 and 30,000 people gather in the town for this event, which consists of mass singing of hymns and spirituals in the open air. Pop. (1950) 2102.

BENSON, Arthur Christopher (1862–1925), English writer and educator, son of Edward White Benson. He became master of Magdalen College, Cambridge University, in 1915. He was joint editor with Viscount Esher of *Queen Victoria's Letters* (1907), and wrote among other works the novels *The House of Quiet* (1901) and *Father Payne* (1916), and the autobiography *Memoirs and Friends* (1924).

BENSON, Edward White (1829–96), English prelate, born near Birmingham, and educated at Cambridge University. In 1875 he was appointed chaplain-in-ordinary to Queen Victoria, and in 1876 bishop of Truro, where he began the building of the cathedral (1880). In 1882 he became archbishop of Canterbury. Among his works are *Cyprian* (1897) and *The Apocalypse* (1900).

BENSON, Ezra Taft (1899–), American agricultural specialist and government official, born in Whitney, Idaho, and educated at Utah State Agricultural College, Brigham Young University, Iowa State College, and the University of California. Between 1923 and 1930 he operated his own farm. He served as chairman of the department of agricultural economics and marketing for the University of Idaho extension service from 1931 to 1938. An active member of the Church of Jesus Christ of Latter-Day Saints, he was elected to the ruling body of the denomination in 1943. Meanwhile, he had become associated with the farmers' co-operative movement and held (1939–44) important posts with the National Council of Farmers Co-operatives and (after 1942) with the American Institute of Co-operation. In January, 1953, President Dwight D. Eisenhower appointed him secretary of agriculture. Benson wrote *Farmers at the Crossroads* (with Carlisle Bargeron, 1956).

BENSON, Frank Weston (1862–1951), American artist, born in Salem, Mass., and

trained in Boston and in Paris. He is best known for his paintings of women and children in out-of-door scenes, and of wild ducks and geese in flight. His work hangs in the Metropolitan Museum of Art, New York City, the Corcoran Gallery, Washington, D.C., and the Chicago Art Institute. Among his well-known paintings are "My Little Girl", "Pomona", "Moonlight at Sea", and two murals in the Library of Congress (Washington, D.C.), "The Seasons" and "The Three Graces".

BENTHAM, JEREMY (1748–1832), English jurist and philosopher, born in London, and educated at Queen's College, Oxford University. He was called to the bar in 1772. Bentham was always more interested in reforming existing laws than in practicing his profession under them. His first book was *Fragment on Government* (1776), in which he criticized the *Commentaries* of the English jurist Sir William Blackstone for its conservatism and dislike of reform. In his *Rationale of Punishment and Rewards* (1825) he urged improvements in the then current methods of punishing criminals. His *Introduction to the Principles of Morals and Legislation* (1789) contained his fundamental ethical doctrine that an action is moral to the degree that it is useful, the usefulness of an action being its capacity for giving pleasure or preventing pain. From this idea it followed that the purpose of all conduct and legislation should be "the greatest happiness of the greatest number", a phrase Bentham derived from a work by the English chemist Joseph Priestley and one by the Scottish philosopher Francis Hutcheson, and which became the basic tenet of his philosophy. In 1823 Bentham helped found the *Westminster Review* for the purpose of disseminating his philosophic radicalism. At the time of his death he was working on a codification of laws, the first volume of which, *Constitutional Code*, had been published in 1827; other volumes appeared in 1841. Bentham's ideas had great influence on the reforms of the latter part of the 19th century in the administrative machinery of the British government, on criminal law, and on procedure in both criminal and civil law. The economist John Stuart Mill was a close friend of Bentham's, his disciple, and the editor of some of Bentham's works. See UTILITARIANISM; ETHICS.

BENTLEY, RICHARD (1662–1742), English classical scholar, born in Oulton, near Wakefield, Yorkshire, and educated at St. John's College, Cambridge University. In 1691 his *Letter to Mill,* a critical discussion of the ancient Greek dramatists, won him recognition as a scholar of profound learning. He is best known for his role in the so-called "ancients and moderns" controversy, in which many celebrated literary men of the time argued the relative merits of ancient and modern authors. In 1699 he exposed as spurious the *Epistles of Phalaris*, a work praised by the defenders of ancient literature. Though correct in his judgment, he was ridiculed by the English satirist Jonathan Swift in *The Battle of the Books* (1704). Bentley was master of Trinity College, Cambridge University, from 1699 until his death. His critical editions of the works of classical writers, especially the Roman poet Horace and the Roman playwright Terence, established his reputation as one of the greatest English classical scholars.

BENTON, THOMAS HART (1782–1858), American statesman, born in Hillsboro, N.C. He settled in Tennessee, where he studied law, and was elected to the legislature. In the War of 1812 he raised a regiment of volunteers, and also served on General Andrew Jackson's staff. Afterward he founded a newspaper in St. Louis, Mo., in the conduct of which he became involved in several duels. From 1820 to 1850 he was United States senator from Missouri. In the Senate he was a determined opponent of nullification (q.v.). After Jackson became President, Benton supported his campaign against the United States Bank, and earned the sobriquet of "Old Bullion" by his opposition to the issuance of paper currency. He wrote *A Thirty Years' View, or a History of the Working of the American Government from 1820 to 1850* (2 vols., 1854–56) and *An Abridgment of the Debates of Congress from 1789 to 1856* (15 vols., 1857).

BENTON, THOMAS HART (1889–), American artist, born in Neosho, Mo., grandnephew of the American statesman Thomas Hart Benton. He studied art at the Art Institute of Chicago and later in Paris, France. From 1935 to 1941 he was director of the department of painting of the Kansas City Art Institute. He specialized in a vigorous and realistic portraiture of the people and occupations of southern and midwestern United States and in scenes from the history of various regions of the United States. The best-known of his historical murals is the series on the history of Missouri in the State House at Jefferson City, Missouri. Other important murals of his are in the New School for Social Research, New York City, and the series "The Arts of Life in America", in the reading room

Museum of Modern Art

"Homestead," painting by Thomas Hart Benton

of the Whitney Museum, New York City; and "The History of Indiana", in the auditorium of the University of Indiana. The Metropolitan Museum of Art in New York City owns his paintings "Cotton Pickers", "July Hay", and "Roasting Ears"; in the Whitney Museum are his "The Meal" and "Martha's Vineyard", as well as a number of watercolors and drawings. Other well-known paintings are "Lonesome Road", "Homestead", and "Susanna and the Elders". Benton is the author of *An Artist in America* (autobiography, 1952).

BENTON HARBOR, city of Berrien Co., Mich., 1 mile from Lake Michigan, in the heart of a fruit-growing and vacation resort area. It has a large, city-owned fruit market, canneries, and factories producing steel castings, wood veneer, and machinery. Pop. (1950) 18,769.

BENUE or **BINUE**, river of w. central Africa and the largest tributary of the Niger. It rises in s. Adamawa, and joins the Niger 300 m. from the coast. Its width varies from about 1600 to 3200 ft., and its navigable length exceeds 600 m. during the wet season. The length of the river is about 850 m.

BENUE, BINUE, or **BENOUÉ**, province of the Northern Provinces, Nigeria, w. central Africa. The population consists mostly of Negroes, some of whom are admixed with Fula and Berber stock. The capital, Makurdi, on the Benue R., is about 250 miles N.N.E. of Port Harcourt. Area, 28,082 sq.m.; pop. (1931) 986,525.

BENVENUTO CELLINI. See CELLINI, BENVENUTO.

BEN-YAHUDA or **BEN-YEHUDA,** ELIEZER, original surname PERLMAN (1858–1922), Hebrew scholar, known as *Maskil* ("the enlightened one"), born in Lithuania. While studying medicine in Paris in 1879, he became interested in Jewish problems. In 1881 he emigrated to Palestine, and four years later established an independent magazine, *Hatzebi*, dedicated to the revival of Hebrew as a living language. He also began to coin new Hebrew words needed in modern life, in most cases by transformation of vernacular Arabic. Together with his son Ben Avi he founded the first Palestinian daily, the *Doar Hayom*, in 1912. The comprehensive Hebrew dictionary he had undertaken to compile was unfinished when he died.

BENZ, KARL (1844–1929), German mechanical engineer, born in Karlsruhe. He was a pioneer in the motor-car industry. In 1878 he developed a two-cycle internal-combustion engine, and later, a light four-cycle engine. He

invented the differential drive and other automotive accessories. In 1885 he built a three-wheeled vehicle with an internal-combustion engine. This vehicle was patented, and driven through the streets of Munich in 1886; Benz thus shared with Gottlieb Daimler the credit of building the first complete automobile.

BENZALDEHYDE, a colorless, aromatic liquid with the formula C_6H_5CHO. The cake which is left after the extraction of the fixed oil from bitter almonds (see ALMOND) contains amygdalin and emulsion or synaptase. When the cake is made into a paste with water, the emulsion acts as a ferment upon the amygdalin, splitting it into benzaldehyde, hydrocyanic (prussic) acid, and grape sugar. This action takes place very rapidly and is complete in 24 hours. The paste yields, by distillation, a product containing benzaldehyde, partly combined with hydrocyanic acid, and water. The hydrocyanic acid may be removed by treatment with ferrous chloride and lime. Benzaldehyde has an agreeable odor and an acrid, bitter taste. It is soluble in water to the extent of 1 part in 300 parts of water, but mixes in all proportions with alcohol and ether. It is a highly refractive liquid, of sp.gr. 1.05 at 15° C. (59° F.); it boils at 179° C. (354° F.). It does not readily freeze, but once frozen the solid melts at —26° C. (—15° F.).

In the presence of air, benzaldehyde is subject to auto-oxidation, that is, oxidation involving a chain reaction. The intermediate product in the chain reaction is a peroxide, and the final product is benzoic acid. A small amount of a reducing agent breaks the chain of this reaction by destroying the peroxide, and is often added as a preservative.

Benzaldehyde is used in perfumery and flavorings and in the synthesis of more complex chemicals, particularly in the dye industry. For industrial purposes benzaldehyde is prepared synthetically, usually from toluene obtained from coal tar or petroleum.

BENZEDRINE, trade name for the synthetic chemical amphetamine (*a*lpha *m*ethyl *phe*nethyl *amine*). It is a colorless liquid, almost insoluble in water, which boils at about 204° C. (400° F.) Benzedrine is similar to adrenaline and ephedrine (qq.v.) in chemical structure and physiological action. Unlike adrenaline, which acts through the peripheral nervous system, benzedrine exerts its chief action on the brain. In the form of benzedrine sulfate it has been used internally as a stimulant in the treatment of mental depression and to induce wakefulness. Used as an inhalant, it gives symptomatic relief in head colds and allergic nasal congestion by shrinking the mucous membranes. In either form benzedrine is habit forming; because of its euphoric effect, it is prized by drug addicts, particularly among juvenile delinquents. As overdosages are toxic, the drug should be used only upon the advice of a physician.

BENZENE (less properly called *benzol* and often confused with *benzine*), a colorless liquid of sp.gr. 0.88 at room temperature; m.p. 5.5° C. (42° F.); b.p. 80° C. (176° F.). It is insoluble in water but miscible in all proportions with organic solvents. It also dissolves in mixtures of alcohol and water. Benzene itself is an excellent solvent for certain elements, such as sulfur, phosphorus, and iodine, for gums, fats, waxes, and resins, and for most simple organic chemicals. It is one of the most commonly used solvents in the organic chemical laboratory. It has a characteristic mild odor and burning taste. If inhaled in large quantities, benzene is poisonous. The vapors are explosive, and the liquid violently inflammable.

Pure benzene burns with a smoky flame because of its high carbon content. When mixed with a large proportion of gasoline it makes a satisfactory fuel. It makes a valuable addition to fuels for internal combustion engines because it is almost insusceptible to detonation, its "octane number" being far above 100. In Europe, where gasoline is expensive, benzene mixed with some toluene and other related compounds has long been added to motor fuels. In America this practice became common during the shortage of high-grade aviation fuels in World War II.

Benzene was first discovered in 1825 by the English scientist Michael Faraday, and in 1842 it was made available in large quantities after it was found that coal tar contains benzene. A ton of coal, if coked in a by-product oven, yields about two gallons of benzene. In the United States alone, more than 35,000,000 gallons a year of pure benzene are still produced by this method, at a wholesale cost of less than two cents a pound. Even larger quantities of impure benzene are now obtained from petroleum, either by direct extraction from certain types of crude oils, or by chemical treatment of gasoline (hydroforming and cyclization). Benzene can also be prepared synthetically, but this process is of no commercial importance.

The structure of the benzene molecule is of the utmost importance to the theory of organic chemistry. Benzene and its derivatives

are included in the important chemical group known as aromatic compounds (q.v.).

BENZIDINE, $NH_2C_6H_4C_6H_4NH_2$, a white or pink solid, of m.p. about 128° C. (262° F.) and b.p. about 402° C. (756° F.); it is slightly soluble in organic solvents and in hot water. Benzidine is made from hydrazobenzene, $C_6H_5NHNHC_6H_5$, by an extraordinary rearrangement of internal structure which takes place when it is treated with acid. Hydrazobenzene is easily obtained from benzene by nitration and reduction. Benzidine is an important dye intermediate. A wide variety of dyes of all colors may be prepared from benzidine and also from certain similar chemicals such as tolidine (prepared from toluene as benzidine is from benzene).

BENZINE, a light, colorless fluid consisting of an indefinite mixture of aliphatic hydrocarbons, obtained from the fractional distillation of petroleum. The term is applied to any of the liquid fractions of lower boiling point than kerosene, especially those used as solvents. Benzine is often indistinguishable in composition from gasoline. It is a good solvent for fats, gums, and resins, and is used extensively in the dry cleaning of clothes and the manufacture of varnishes and drugs. Being volatile and inflammable, it is used also for the enrichment of coal gas, and in certain instances, for fuel. Because of the confusion of the term "benzine" with the name of the coal-tar product "benzene" (q.v.), the more specific terms "naphtha" and "petroleum ether" (qq.v.) are preferred in modern usage.

BENZOATE OF SODA, or SODIUM BENZOATE, the sodium salt of benzoic acid, a white, crystalline solid soluble in water and slightly soluble in alcohol. It is antiseptic, and is much used as a preservative in foods. In large quantities it is toxic, and U.S. Federal law prohibits the use of more than a small quantity in food. It also has medicinal properties, and is used occasionally in the treatment of rheumatism and gout.

BENZOIC ACID, C_6H_5COOH, a white crystalline solid, slightly soluble in water and soluble in organic solvents. It melts at 122° C. (252° F.) and boils at 249° C. (480° F.), but tends to sublime (pass directly from the solid to the vapor state) at temperatures above 100° C. (212° F.). When sublimed under certain conditions, the vapor may resolidify in the form of a fine dust. Benzoic acid is a moderately weak acid, stronger than acetic acid but weaker than formic acid.

Benzoic acid occurs in several natural substances, notably gum benzoin, of which it constitutes as much as 25 percent. It may be isolated by sublimation. Benzoic acid may be synthesized by a wide variety of methods; industrially it is prepared from toluene obtained from coal tar or petroleum, or from naphthalene obtained from coal tar.

The medical uses of benzoic acid are not essentially different from those of benzoate of soda (q.v.), since the latter is converted into benzoic acid in the stomach. In both cases the kidney converts the benzoic acid into hippuric acid, which is excreted. Benzoic acid is used in perfumery, and is an important raw material for a wide variety of synthetic substances, including dyes, pharmaceuticals, and flavorings.

BENZOIN. 1. A chemical compound, $C_6H_5CHOHCOC_6H_5$, a white solid almost insoluble in water, but slightly soluble in organic solvents. It has m.p. about 137° C. (279° F.), and b.p. about 343° C. (649° F.). It is readily prepared by the reaction between two molecules of benzaldehyde in the presence of cyanide. Benzoin is used as a raw material for synthesizing many other compounds. Its name is derived from its relationship to benzoic acid, which was so named because it was originally prepared from gum benzoin. **2.** A resin, called also gum benzoin or gum benjamin, obtained from the tree *Styrax benzoin* or from other trees of the genus *Styrax* (q.v.), in Thailand and Indonesia. Incisions are made in the bark of the tree, and the gum exudes and hardens. The fresh juice is thick and white, but as seen in commerce it is a hard, fragrant solid, frequently yellow or red in color. Depending on the source, gum benzoin contains 20 to 25 percent of benzoic acid, and sometimes large quantities of cinnamic acid. It was formerly extensively used in incense, perfumery, and medicines, but is now much less used. **3.** A genus of plants in the family Lauraceae, totally unrelated to *Styrax*. Common names for this genus include benjamin bush, feverbush, spicebush, and wild allspice. When the leaves are crushed, a strong odor, similar to that of gum benzoin, is produced. *B. aestivale* is common in N.E. United States in damp woods. It is a hardy, deciduous shrub 6 to 15 feet in height. The honey-yellow flowers appear in March or April, before the leaves appear.

BEN-ZVI, IZHAK (1884–), Israeli statesman, born in Poltava, Ukraine, and educated at the University of Kiev and at Imperial Ottoman University, Constantinople (now Istanbul). He became an active Zionist (see

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Beowulf (from lithograph by Rockwell Kent)

ZIONISM), in his youth. A founder of the Russian Zionist labor movement, he fled Russia in 1905 to escape arrest by czarist police. He settled in Palestine in 1907, and the next year helped to organize the first Jewish defense force in Palestine and the first Hebrew secondary school in Jerusalem. During World War I he was exiled by the Turks for pro-Allied and Zionist activities. He came to the United States in 1916 and helped organize the pioneer movement for the settlement of Palestine. Subsequently he helped recruit the American battalion of the Jewish Legion. He served with the Legion in Palestine in 1918. Following the establishment of Palestine as a British mandate, Ben-Zvi became the official spokesman of the *Vaad Leumi,* the newly formed governing body of the Palestinian Jewish community. Meanwhile he was prominent in the Palestine labor movement and worked to further the cause of an independent Jewish state. Upon the termination (May, 1948) of the British mandate, he became a member of the provisional government of the newly created Republic of Israel; later he was elected to the *Knesset* (parliament). He succeeded Chaim Weizmann as president of Israel in November, 1952. Among his writings are *Arabs and Moslems* (1926), *Book of the Samaritans* (1935), and *Communities in Exile* (1953).

BEOGRAD. See BELGRADE.

BEOTHUK, American Indian tribe formerly inhabiting the interior of Newfoundland. Its members were called "Red Indians" by the white settlers. Owing to their implacable hostility to the Whites, they were hunted down like wild beasts until about 1820, when a handful of survivors crossed the straits and found a hiding place in the frozen wilds of Labrador, where descendants may still exist. From the few words of their language that are preserved, some scientists have concluded that they constituted a distinct stock.

BEOWULF, an Old English epic poem. It is the most important work of Anglo-Saxon literature (see ANGLO-SAXON LANGUAGE AND LITERATURE), and the oldest extant epic of the Teutonic peoples. The unique manuscript of the poem, now in the British museum, is written in the West-Saxon dialect, and is believed to date from the latter part of the 10th century. The composition of the poem in its present form is placed as early as the 8th century. The lines of the poem are alliterative and unrhymed. Each line consists of four accents and is divided by a caesura. The events described in *Beowulf,* in vigorous, rough, somber, and picturesque language, are as follows. The monster Grendel—half man, half fiend—comes every night from the fens into the splendid hall of Hrothgar, King of the Danes, and carries off to his subterranean dwelling a number of the king's thanes and devours them. Beowulf, a prince among the Geats (of south Sweden), hearing of this, crosses the sea with fourteen companions to rid Hrothgar of the sea fiend. In a mighty struggle in the hall at night Beowulf performs his exploit. Grendel, after having an arm wrenched from its socket, flees to the fens to die. The next night Grendel's mother comes to the hall to avenge the death of her son and bears away one of Hrothgar's counselors. Beowulf, who is absent, is sent for in the morning. He descends to the caves of the sea and slays the water demon with a sword wrought by the giants. Beowulf returns to his country, where he becomes king and rules for fifty years. Then a dragon, having been robbed of a cup from an immense hoard which he had guarded for three hundred years, becomes enraged and devastates the land. Beowulf, though weakenend by great age, kills the dragon with the aid of Wiglaf, a kinsman. But, severely wounded during the encounter, Beowulf dies after viewing the treasures.

BERANEK, Leo Leroy (1914–), American physicist, born in Solon, Iowa, and educated at Cornell College, Iowa, and Harvard University. He was instructor in physics and communications engineering at Harvard in 1940, assistant professor from 1941 to 1943, and director of the electro-acoustics laboratory from 1943 to 1946. In 1947 he became associate professor of comunications engineering and technical director of the acoustics laboratory at the Massachusetts Institute of Technology. He wrote *Principles of Sound Control in Airplanes* (with others, 1944) and *Acoustic Measurements* (1948).

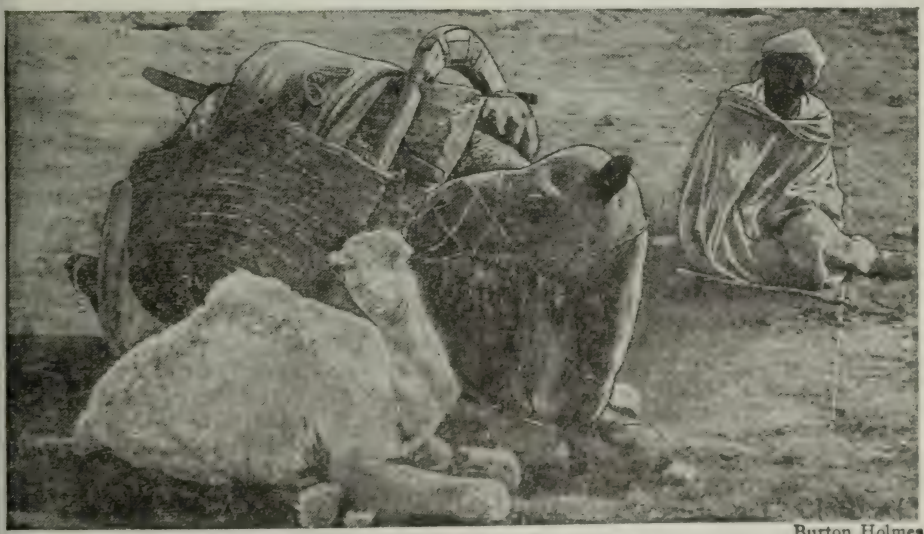
BÉRANGER, Pierre Jean de (1780–1857), French lyric poet and writer of political songs, born in Paris. He lived in poverty until 1804, when one of his revolutionary songs brought him to the notice of Lucien Bonaparte, brother of the French emperor Napoleon I and a strong republican sympathizer. Bonaparte supported the poet for several years, until Béranger obtained a clerkship in the office of the Imperial University. On the publication of the first collection of his songs in 1815, he was recognized as the lyrical champion of the republican faction in France. The *chanson*, with which the 18th-century writers had trifled in praise of love and wine, became in his hands a trenchant political weapon. He was imprisoned for the sentiments expressed in two of his works published in 1821, and again for a volume published in 1825. His works also include *Chansons Nouvelles* (1830), and his autobiography published (1858) after his death.

BERAR. See Madhya Pradesh.

BERBERA, town and port of British Somaliland, British East Africa, on the Gulf of Aden, about 170 miles s. of Aden. Its harbor is navigable by ocean-going ships. During the comparatively cold season, from October to April, the population is greatly increased by caravan traders who trade mainly in coffee, grain, ivory, cattle, and ostrich feathers. The principal imports are rice, sugar, and cotton. Permanent pop., about 15,000; seasonal pop., about 30,000.

BERBERIDACEAE, or Barberry Family, a family of plants in the order Ranunculales. They are perennial herbs or shrubs, some evergreen and others carrying their leaves into midwinter. The fruit is a pod or berry. Some of the species have spiny stems and attractive berries of various colors, and are often used for hedges. The genera native to the U.S. are *Podophyllum*, may apple; *Jeffersonia*, twinleaf; *Diphylleia*, umbrella leaf; *Caulophyllum*, blue cohosh; and *Berberis*, barberry. See Barberry.

BERBERS, name given to the tribes of the Hamitic linguistic family inhabiting the mountainous regions and the northern portions of the Sahara Desert, in N.W. Africa. They call themselves by such names as Amázigh, Mazigh, and Mazys, according to locality; e.g., the Riffs are so called from the hills in which they live. The Berbers formerly



Burton Holmes

Berber in the Sahara Desert, with his camel and its calf

A Berber shepherd

inhabited the coastal regions from Egypt to the Atlantic Ocean, but during the Arab conquest (7th century) of North Africa they were driven to the Atlas Mountains and to the desert regions. In Algeria, where they usually are termed Kabyles (q.v.), they long remained unconquered by the French, and in Morocco, where they are called Shelluh, they are only nominally subject to the sultan. Those occupying the desert, who are called Tuareg (q.v.) or Tawarek by the Arabs, have become much mixed with the Negro race. The Berbers are of middle stature, sparely but strongly built, and their complexion varies from reddish to yellowish brown. They are usually at war either with their neighbors or among themselves; they are possessed of a wild spirit of personal independence, and it is difficult for them to unite for any common purpose. However, under the Riffian leader Abd-el-Krim, the Berbers of the Riff region of Morocco successfully resisted Spanish overlordship between 1921 and 1924. They attacked French Morocco in 1925, but were defeated in the following year. Many Berbers live in clay huts and tents, but in their larger villages they build stone houses. They have herds of sheep and cattle and raise various crops, including cereals. The mines in the Atlas Mountains are worked by them, and they manufacture swords, guns, and gunpowder. The Berbers are Mohammedans.

BERBICE, county of British Guiana, situated in the N.E. section of the colony, and adjoining the Atlantic Ocean. Sugar, molasses, timber, cacao, rum, and tropical fruits are the chief products. The capital, New Amsterdam (pop., about 8000), is situated at the mouth of the Berbice River, after which the county is named. Area, 16,920 sq.m.; pop. (1946) 96,623.

BERCEO, GONZALO DE. See GONZALO DE BERCEO.

BERCHET, GIOVANNI (1783–1851), Italian poet and patriot, born in Milan. Exiled in 1821 because of his writings favoring Italian liberation from Austrian rule, he returned to Italy in 1848 and became a member of the parliament of Sardinia. Most of his poems are on political and patriotic subjects.

BERCHTESGADEN, town of Upper Bavaria, West Germany, situated 10 miles S. of Salzburg. It is a summer resort. Near the town was located the German political and military leader Adolf Hitler's famous palace "Wachenfeld". The town was captured by American forces during World War II on May 4, 1945. Pop. (1946) 5752.

BERCHTOLD, COUNT LEOPOLD VON (1863–1942), Austro-Hungarian statesman, born in Vienna. Berchtold entered the diplomatic service at an early age. He was appointed ambassador to Russia in 1906, and became foreign minister in 1912. In 1914 he signed the ultimatum which Austria-Hungary delivered to Serbia and which was followed by the outbreak of World War I. He resigned as foreign minister in 1915. After the collapse of the Austro-Hungarian monarchy in 1918, Berchtold retired from active political life.

BERCOVICI, KONRAD (1882–), American author, born in Braila, Romania, and educated privately. He came to the United States in 1916, and for a time was a staff member of the New York City newspapers the *World* and the *Post*. He contributed numerous short stories to American magazines, and wrote numerous books, among which are *Crimes of Charity* (1917), *Around the World in New York* (1918), *Ghitza* (1919), *Murdo*

(1921), *That Royal Lover* (1931), *The Incredible Balkans* (1933), the autobiography *It's the Gypsy in Me* (1941), and *The Exodus* (1947).

BEREA COLLEGE, coeducational institution situated at Berea, Ky., founded in 1855 to promote the cultural and material welfare of residents of the southern Appalachian region. In addition to programs of study leading to A.B. degrees in liberal arts and B.S. degrees in business, agriculture, and home economics, the school provides instruction at primary and secondary levels for students fifteen years of age and over. Tuition is free, and opportunities for self-support are available to enrollees through the student labor program. This system, operated in conjunction with the academic program, provides jobs and practical training in various college-owned industries, including the electric, water, and other utilities of the college and town, a printing plant, a tavern, and such enterprises as weaving and broom making. In 1952–53, 1022 full-time students were enrolled; the faculty numbered 104.

BERENICE, name of two ancient towns. **1.** A seaport in Egypt, situated on a bay on the W. coast of the Red Sea. It was founded about 275 B.C. by King Ptolemy II, who gave it the name of his mother. During the Macedonian dynasty and, subsequently, under Roman rule, Berenice was a flourishing commercial center. A caravan route, which is still in use, extended from the town N.W. across the desert to the Nile River. Various ruins, including remnants of a Roman temple, mark the ancient site, which adjoins the modern town of Sikket Bender-el-Kebir. The harbor is navigable only for shallow-draft vessels. **2.** A city of ancient Cyrenaica, the site of which is now occupied by Bengasi (q.v.).

BERENICE or **BERNICE,** name of two Jewish princesses. **1.** BERENICE (fl. about 1 B.C.), daughter of Salome and niece of Herod the Great. By her first husband, Aristobulus, she was the mother of Herod Agrippa I. **2.** BERENICE (fl. about 50 A.D.), daughter of Herod Agrippa I. She was successively the wife of Marcus, son of a magistrate in Alexandria, of her uncle, Herod of Chalcis, and of Polemon, King of Cilicia. Abandoning Polemon, she lived for a time with her brother, Herod Agrippa II, with whom she was accused of incest. During her residence at her brother's court, the apostle Paul was placed on trial before a tribunal composed of Berenice, Herod Agrippa II, and Porcius Festus, Roman procurator of Judea (Acts 25 and 26). In 75 A.D. she followed her brother to Rome, where she became the mistress of Titus. When the latter became emperor (79 A.D.), he sent Berenice back to Judea.

BERENSON, BERNHARD (1865–), American art critic, born in Vilna, Lithuania. He was brought to the United States at an early age and was educated at Harvard University. Subsequently he traveled to Italy and, settling near Florence, devoted himself to the task of becoming an authority on Italian painting. He was considered one of the most notable art critics of his time. His principal works are *Venetian Painters of the Renaissance* (1894), *Lorenzo Lotto* (1895; rev. ed., 1953), *Florentine Painters of the Renaissance* (1896), *Central Italian Painters of the Renaissance* (1897), *Study and Criticism of Italian Art* (1901, 1902, 1915), *Drawings of Florentine Painters* (1903), *North Italian Painters of the Renaissance* (1907), *A Siennese Painter of the Franciscan Legend* (1910), *Venetian Painting in America—the Fifteenth Century* (1916), *Essays in the Study of Siennese Painting* (1918), *Three Essays in Method* (1927), *Italian Pictures of the Renaissance* (1932), *Aesthetics and History in the Visual Arts* (1948), *Rumor and Reflection* (1949), *Caravaggio* (1951), and *Sicily Revisited* (1955).

BEREZINA, river of White Russia, U.S.S.R., rising in the marshes near the town of Borisov. It flows S. for about 350 miles to the Dnieper R., which carries its waters to the Black Sea. It is connected also with the Baltic Sea by a canal to the Dvina R. The Berezina is important commercially, especially for the transport of timber. From Nov. 26 to 29, 1812, during the retreat of the army of Napoleon I from Moscow, more than 10,000 French soldiers died under Russian artillery bombardment while crossing the Berezina near Borisov.

BEREZNIKI, city of Molotov Region, Soviet Russia, on the Kama R., about 125 miles N.E. of Molotov. It is a manufacturing center. Pop. (1939) 63,575.

BERG, ALBAN (1885–1935), Austrian composer, born in Vienna, and trained there under the Austrian composer Arnold Schönberg (q.v.). Berg became one of Schönberg's best-known disciples, and a skillful composer in the twelve-tone system (q.v.), a method of composing music devised by Schönberg and characterized by complete atonality (q.v.) in its harmony and by great complexity of form. In his mature works Berg developed a style of marked individuality, notable for its emotional intensity and its frequent application to morbid subject matter. From 1908 to

1924 he composed songs, chamber music, and several orchestral works. In 1925 his best-known work, the tragic opera *Wozzeck*, was produced at Berlin, and in 1931 at Philadelphia and New York City. Other important works by Berg are his violin concerto (posthumously produced at Barcelona in 1936) and his opera *Lulu* (posthumously produced at Zurich in 1937).

BERG, PATRICIA JANE, known as PATTY BERG (1918–), American golf champion, born in Minneapolis, Minn., and educated at the University of Minnesota. She became an amateur golfer in 1932, and won the women's national golf championship in 1938. Among other golf tournaments in which she was the winner were the Women's Western Open in 1943, 1948, 1951, and 1955, and the Women's National Open in 1946. In 1949 she tied the women's record of 295 strokes for 72-hole medal play in the Tampa Women's Open. She won the All-American Women's Open in 1953, and the "World's" Championship (women's division) in 1953 and 1954.

BERGAMO, capital of the province of the same name, Lombardy, Italy, situated 33 miles N.E. of Milan. It consists of a medieval "upper city", built on a hill, and a modern, industrial "lower city", built on the plain. The Victor Emmanuel Institute of Technology, with a fine museum, is housed in one of the medieval palaces grouped around the Piazzo Garibaldi; the civic library occupies another. The 12th-century church of Santa Maria Maggiore, a 17th-century cathedral, the Colleoni chapel, and an art school, the Academia Carrara, are also of interest. The modern city is on the site of ancient *Bergomum*, a Gallic settlement which received Roman municipal rights from the Roman general and statesman Gaius Julius Cæsar and was destroyed in the 5th century by the Huns under King Attila. After it was rebuilt it became successively the capital of a Lombard duchy, a dependency of the city of Milan, and, from 1428 to 1797, a part of the Venetian Republic. Later it became part of the Kingdom of Lombardy. In the city and the surrounding area are factories for the manufacture of silk and other fabrics. Other products of the city and province are articles of clothing, iron tools, pottery, and organs. The operatic composer Gaetano Donizetti was born in the city in 1797. Area of province, 1065 sq.m.; pop. (1936) 605,810. Pop. of city (1951) 105,399.

BERGAMOT, a citrus fruit, *Citrus bergamia,* grown in southern Europe. It is similar to a lime in size and to a pear in shape; the rind is smooth and golden, and the pulp green, subacid, and firm. Oil of bergamot, used as an essential oil for perfumery and flavorings, is prepared from the rind. The best oil is obtained by pressing; an inferior oil is obtained by distillation. The oil is a thin, greenish liquid of bitter taste. Its aromatic odor is due chiefly to bergamol, which constitutes about 20 percent of the oil and consists chemically of linaloöl acetate, $C_{12}H_{20}O_2$. Oil of bergamot also contains certain related compounds called terpenes, similar to those found in oil of lemon and oil of orange. Oil of bergamot is produced chiefly in s. Italy. The term "bergamot" is used also for a variety of pear, and for certain species of mint.

BERGEN, Flemish name of the city of Mons (q.v.), Belgium.

BERGEN, city and seaport, coextensive with the county of the same name, and county seat of Hordaland Co., Norway, situated on an inlet of the Atlantic Ocean, about 185 miles W.N.W. of Oslo. It is the second-largest city (after Oslo) in population in the country and a popular vacation resort. Harbor facilities include numerous docks and several shipyards. Transoceanic and coastwise steamship lines serve the port; imports consist mainly of coal, iron, grain, and foodstuffs, and the principal exports are fish and fish products. Shipbuilding, the distillation of alcohol, fish processing, and the manufacture of cordage, paper, tobacco products, and pottery are important industries.

Among ecclesiastical edifices in Bergen are the cathedral, with portions dating from the 13th century, and the Church of St. Mary. The foremost cultural institutions are an art gallery, with an outstanding collection of Norwegian paintings, and several museums, including the Hanseatic Museum and an industrial museum. Bergen is the birthplace of the composer Edvard Grieg, the violinist Ole Bull, and the writer Ludvig Holberg.

Founded by King Olaf III of Norway in 1070, Bergen soon became one of the leading cities of the kingdom. During the 15th and 16th centuries it was one of the chief northern strongholds of the Hanseatic League. Large sections of the original city were destroyed by fires, notably in 1702, 1855, and 1916. German invaders devastated parts of Bergen in 1940, during World War II. Pop. (1950) 112,845.

BERGEN, EDGAR JOHN (1903–), American comedian and ventriloquist, born in Chicago, Ill. His career as an entertainer began

Netherlands Info. Bureau

Gavangenpoort, the old town gate, in Bergen-op-Zoom, the Netherlands

in 1922, when he toured the Chautauqua circuits as a magician and ventriloquist. He appeared in vaudeville from 1926 to 1936. Thereafter he attained popularity as a ventriloquist on the radio and television and in motion pictures, featuring the comic dummies "Charlie McCarthy" and "Mortimer Snerd".

BERGENFIELD, borough of Bergen Co., N.J., 8 miles E. of Paterson. It is an industrial community, with plants engaged in the manufacture of pianos, clothing, and machinery. Pop. (1950) 17,647.

BERGEN-OP-ZOOM, town in the province of North Brabant, Netherlands, 21 miles N.W. of Antwerp, situated on the river Zoom near its entrance into the east branch of the Schelde R. The Dutch made the town one of their strongholds in their struggles with Spain, and the Spaniards, who had been expelled in 1577, unsuccessfully attempted to capture it in 1581, 1588, 1605, and 1622. The fortifications were afterward so strengthened by the engineer Menno van Coehoorn as to give it the reputation of being impregnable. However, after a siege of nearly three months in 1747 during the War of the Austrian Succession, the French took the town by storm; they gave it up under the Treaty of Paris in 1814. The principal industry of the town is fishing; an extensive trade in anchovies and oysters is carried on. Pop. (1953 est.) 31,299.

BERGER, VICTOR LOUIS (1860–1929), American Socialist leader, born in Nieder Rehbach, Austria-Hungary, and educated at the universities of Budapest and Vienna. He took up residence in Milwaukee, Wis., in 1878. He was the first Socialist to serve in Congress, being elected to the House of Representatives in 1911. He wrote against American participation in World War I even after the U.S. entered the war; as a result, in December, 1918, he and four other Socialists were brought to trial charged with violation of the Espionage Act. After a legal battle that attracted national attention, on January 8, 1919, he was found guilty and sentenced to serve twenty years in prison, and in November of the same year the House of Representatives voted to exclude him from his seat in Congress. Berger's conviction was reversed by the U.S. Supreme Court in 1921, and in the following year the indictments against him were dismissed. In November, 1922, he was again elected to Congress, and in December, 1923, was finally permitted to assume his office. He was re-elected to the 69th and 70th Congresses but was defeated when he ran again in November, 1928. In 1924, with the American Socialist leader

United Artists Corp.
Ingrid Bergman

Morris Hillquit and others, he supported the candidacy of Robert M. La Follette for President. He was delegate of the American Socialist Party to the International Socialist Congress at Marseilles, France, in 1925. After 1927 he was chairman of the National Executive Committee of the Socialist Party.

BERGERAC, SAVINIEN DE CYRANO DE. See CYRANO DE BERGERAC, SAVINIEN DE.

BERGH, HENRY (1811–88), American philanthropist and humanitarian, born in New York City, and educated at Columbia University. He founded in 1865 the Society for the Prevention of Cruelty to Animals, of which he was president until his death. During that time, due largely to his efforts, laws forbidding cruelty to animals were passed in thirty-nine States. In 1875 he founded the Society for the Prevention of Cruelty to Children, which grew rapidly and soon had branches in nearly every State. See CRUELTY TO ANIMALS; CRUELTY TO CHILDREN.

BERGIUS, FRIEDRICH (1884–1949), German chemist, born in Goldschmieden, and educated at several German universities. He became interested in the synthesis of organic compounds under high pressure and wrote a book on this subject in 1913. Further researches in the same field led to his production of synthetic gasoline by treatment of finely powdered coal with hydrogen gas at high temperature and pressure. Although only a small percentage of the world's gasoline is today produced by this process, it is still a practical method of great importance. He was awarded one half of the Nobel Prize in chemistry in 1931.

Bergius made another outstanding chemical discovery, a method of manufacturing food from wood. Wood chips treated with cold, concentrated hydrochloric acid produce sugars which, after processing, may be used as food for cattle and, under certain conditions, for human beings. This process is in use in many parts of the world; the sugar thus produced is usually fermented to produce industrial alcohol. By-products of the process include lignin (which may be converted into plastics) and other chemicals, such as acetic acid, usually produced by destructive distillation of wood.

BERGMAN, INGRID (1917–), stage and motion-picture actress, born in Stockholm, Sweden, and trained at the Royal Dramatic Theatre School. She played leading roles in Swedish plays and motion pictures, the most important of the latter being *Intermezzo.* Her American acting career began successfully with an English version of *Intermezzo* (1939). She then appeared in many other films, including *Adam Had Four Sons* (1941), *Rage in Heaven* (1941), *Casablanca* (1942), *For Whom the Bell Tolls* (1943), *Spellbound* (1945), *Joan of Arc* (1948), and *Paris Does Strange Things* (1957); and in the stage plays *Liliom* (1940) and *Joan of Lorraine* (1946). In 1944 her performance in *Gaslight* and in 1956 her performance in *Anastasia* won the Motion Picture Academy Award and the New York Film Critics' Award for the best performance of the year by a leading actress. She has appeared in several Italian films, including *Stromboli* (1950) and *The Greatest Love* (1954).

BERGONZI, CARLO (about 1686–1747), Italian violinmaker, born in Cremona, and trained there under the celebrated Italian violinmaker Antonio Stradivari. Little is known of Bergonzi's life beyond the facts that he practiced exclusively in Cremona and that he resided in Stradivari's house in that city after the death of his master's younger son in 1742. His instruments, which are now comparatively scarce, rank among the most valuable of the Cremonese school; they are especially notable for the beauty of their varnishes, which range in color from reddish brown to orange red, and for their remarkable tone.

BERGSON, HENRI LOUIS (1859–1941), French philosopher, born in Paris, and edu-

cated at the Ecole Normale. In 1900 he was appointed to the chair of philosophy at the Collège de France. His philosophy was founded on the belief that the material universe is subject to the domination of a vital force (*élan vitale*); that it is in a state of "creative evolution", which is the basis of reality; and that this process can be comprehended only by intuition, and not by reason. He was elected to the French Academy in 1914, and was awarded the Nobel Prize in literature for 1927. During World War II, when the German-dominated government of occupied France passed anti-Jewish legislation, Bergson, being of Jewish parentage, renounced all his French posts and honors. His lectures were widely popular, and his writings, because of his ability to express philosophic thought in language understandable to the layman, achieved world-wide fame. He influenced not only philosophers, but writers in other fields, such as novelists, literary critics, psychologists, and sociologists. His works include *L'Evolution Créatrice* (1907) and *L'Énergie Spirituelle* (1919)

BERGYLT, European name for several fish, particulary the rosefish (q.v.).

BERIA, Lavrenti Pavlovich. See Berya, Lavrenti Pavlovich.

BERIBERI, diet-deficiency disease caused by a lack of vitamin B_1. The disease is characterized by an inflammation of the nerves, causing neuralgia, muscular inco-ordination, and paralysis. In advanced cases, progressive lassitude and edema (dropsy) appear. Death may ensue from heart failure due to edema and weakness of the heart muscle. The disease is prevalent in tropical and subtropical regions all over the world, but especially in those parts of the Orient where the main article of diet is polished rice. Recovery is prompt on restoration of adequate amounts of vitamin B_1 to the diet.

BERING, Vitus (1680–1741), Danish navigator, born in Horsens. He entered the newly formed navy of Peter the Great of Russia, and, for the ability and daring he displayed in the wars with Sweden, was appointed to conduct an expedition of discovery in the Sea of Kamchatka (now known as Bering Sea). After some years spent in explorations on the coast of Kamchatka, the Sea of Okhotsk, and northern Siberia, he sailed in June, 1741, from Petropavlovsk toward the American continent. He sighted the continent N. of what is now Cape St. Elias, Alaska, on July 29, and shortly afterward landed on present-day Kayak Island. During the return voyage his vessel, the St. Peter, encountering storms and fog, was wrecked (November 16) on an uninhabited island subsequently named Bering Island in his honor. Bering, who was ill at the time of the disaster, died there of exposure one month later. His companions built a vessel in which they returned to Kamchatka with more than $100,000 worth of furs trapped on the island.

BERING ISLAND, one of the largest of the Komandorskie Islands, situated E. of the Kamchatka Peninsula, in the S.W. portion of the Bering Sea, and forming part of Khabarovsk Territory, Soviet Russia. Like the other islands of the Komandorskie group, it is barren and treeless. It is the site of Soviet naval and radio stations, but is otherwise uninhabited. The island was named in honor of the Danish navigator Vitus Bering, who died there in 1741 while in the service of Russia. Area, about 615 sq.m.

BERING SEA, part of the North Pacific Ocean, lying between the Aleutian Islands on the S., and the Bering Strait, by which it is connected with the Arctic Ocean, on the N. On the W. are the Kamchatka and Chukotsk peninsulas of northeastern Asia, and on the E. is Alaska. The sea is named in honor of the Danish explorer Vitus Bering. Its total area is about 878,000 sq.m. It receives the waters of the Anadyr R. of Asia and of the Yukon R. of North America. Fogs prevail and, in the winter, pack ice forms as far S. as Saint Matthew Island (about 61° N.), and ice floes extend S. of the Pribilof Islands (about 56° N.). Among other islands in the Bering sea are Saint Lawrence Island (about 63° N.), Nunivak Island (about 60° N.), and the Komandorskie Islands (about 55° N.).

BERING SEA CONTROVERSY, an international dispute arising (1886) out of attempts by the United States government to prohibit Canadian vessels from fishing for seals in the waters off the Pribilof Islands (q.v.), American-owned and protected fur-seal rookery. The U.S. Congress had adopted legislation forbidding pelagic sealing in the waters adjacent to the rookery as early as 1868, one year after Alaska and the offlying islands were acquired from Russia, and the rookery itself had been leased to a commercial organization; under the terms of the lease the slaughter was limited to 100,000 seals annually. In 1881, following protests from the American-licensed company against the indiscriminate slaughter of seals by foreign-flag vessels, the U.S. government ruled, in effect, that pelagic sealing was prohibited in the Bering Sea east of the

line demarcating Russian and American territory, thereby asserting American jurisdiction over part of the high seas. Implementation of the ruling was delayed until 1886, when three Canadian sealing vessels were seized by an American revenue cutter. After the seizure (1887) of additional Canadian sealers the British government protested to the United States. Attempts by the two governments to arrange an international conference on the points at issue ended (1888) in failure; in 1889 the United States seized several Canadian sealers. Vigorous representations by Great Britain led to resumption of negotiations, and in February, 1892, the countries concluded an agreement providing for international arbitration of the dispute.

The court of arbitration, consisting of representatives of France, Italy, Sweden, Norway, Canada, Great Britain, and the United States, rejected (August, 1893) American claims to territorial jurisdiction over the Bering Sea but, in deference to the American contention that preservation of the species was a common interest of mankind, adopted regulations restricting the operations of pelagic sealers. The regulations proved to be completely ineffectual. According to reliable estimates the herds were depleted by more than 66 percent during the next few years. Pelagic sealing was finally abolished under the provisions of a treaty concluded (1911) by Japan, Russia, Great Britain, and the United States.

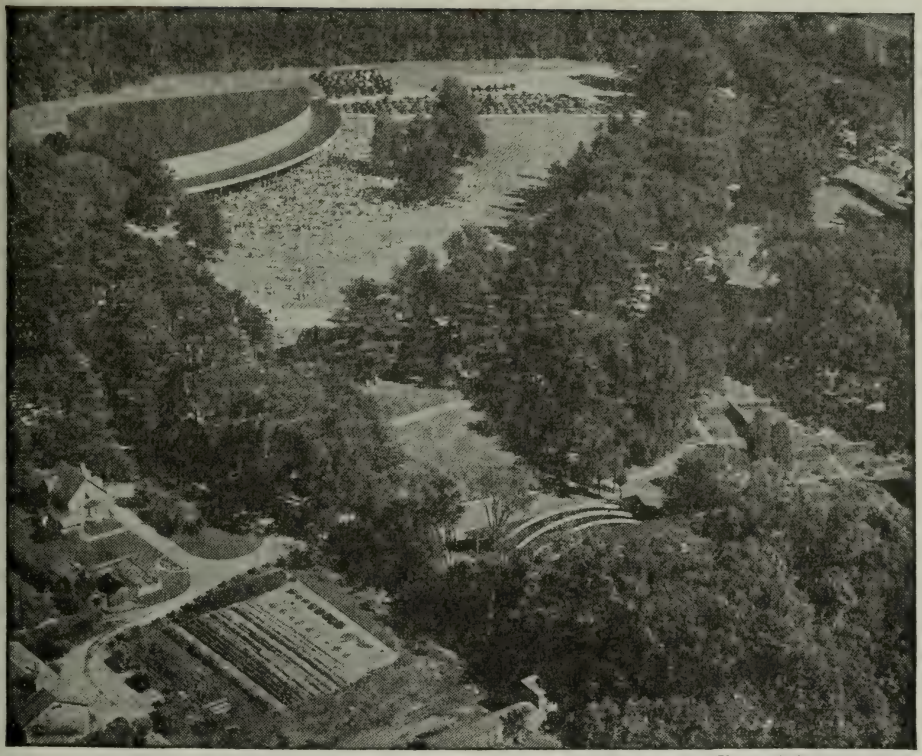
BERING STRAIT, body of water separating Asia from America and connecting the Pacific Ocean with the Arctic Ocean. It was first discovered and explored by the Russian navigator Simon Dezhnev in 1648; it was again explored by the Danish navigator Vitus Bering in 1728, and later by the British mariners James Cook and Frederick William Beechey. The narrowest part of the strait is near lat. 66° N., between East Cape (formerly Cape Dezhnev) in Asia and Cape Prince of Wales in America. The distance between the two capes is approximately 40 miles. About midway are the Diomede Islands (q.v.).

BERKELEY, city of Alameda Co., Calif., on the mainland shore of San Francisco Bay, 6 miles across the bay from the city of San Francisco. It is an educational and cultural center, and is the site of the University of California, Armstrong and Williams business colleges, the Pacific School of Religion, the Baptist Divinity School, the Church Divinity School of the Pacific (Episcopal), the Pacific Unitarian School for the Ministry, and the State schools for the deaf and blind. Berkeley is noted also as a residential city. It has, however, an extensive commerce because of its location in the East Bay metropolitan area. Industries in the city include the manufacturing of soups and other food products, soaps, vaccines and serums, gasoline engines, foundry products, printing inks, and varnishes. Berkeley, named in honor of the English philosopher and churchman George Berkeley, was incorporated as a town in 1878 and was chartered as a city in 1909. Since 1923 it has had a council-manager form of government. Pop. (1950) 113,805.

BERKELEY, GEORGE (1685–1753), Irish philosopher and churchman, born in Kilkenny County, and educated at Trinity College, Dublin. At Trinity he was deeply influenced by the views of the English philosopher John Locke (q.v.). In 1709 Berkeley completed *Essay towards a New Theory of Vision,* in which he extended Locke's ideas on the character of matter. This he followed with *Treatise Concerning the Principles of Human Knowledge* (1710) and *Three Dialogues between Hylas and Philonous* (1713), works that further developed his philosophy of subjective idealism. Meanwhile Berkeley had been ordained in the diaconate of the Church of England, and following publication of his *Discourse on Passive Obedience* (1711), an essay on theological utilitarianism, he became increasingly prominent as a churchman. In 1724, after several trips abroad, he was appointed dean of Derry. He obtained, in 1725, a charter from the British government authorizing him to establish in Bermuda a college to train missionaries to the American Indians and pastors for the American colonies. Resigning his deanery in 1728, he spent the next three years in the colony of Rhode Island. There he continued to write while waiting, in vain, for an appropriation by the British government to finance his Bermuda project. In 1734, three years after his return to England, he was appointed bishop of Cloyne. He retired in 1752.

Berkeley's philosophy is one of idealism, developed in an effort to discredit the materialism of his time. He maintained that matter cannot be conceived to exist independent of the mind. In other words, matter exists only to the extent that man perceives it. Since there is no external world, he argued, the phenomena of sense can be explained only by supposing a deity which continually and coherently evokes perception in the mind of man.

In addition to those already cited, his works include *Alciphron, or the Minute Philosopher*



Howard S. Babbitt, Jr.

Berkshire festival: aerial view of the Tanglewood grounds during a concert

(1733) and *Theory of Visual Language Vindicated* (1733).

BERKELEY, Sir William (1606–77), British colonial governor, born in Bruton, Somersetshire, and educated at Oxford University. He was appointed commissioner to Canada in 1632 and in 1641 was commissioned governor of Virginia. During the Civil War in England Berkeley kept that colony loyal to the king until 1651, when the English lord protector Oliver Cromwell sent a fleet to depose him. Though Berkeley and his followers were forced to acknowledge Cromwell's rule, and Berkeley was removed as governor, he remained in the colony, and in 1660 was chosen governor by the general assembly, receiving his commission for the office from King Charles II. He soon completely lost favor with the people because of his arbitrary policy, his obstinacy, and his persistent refusal to furnish protection against the Indians; a rebellion against him led by Nathaniel Bacon (see Bacon's Rebellion) failed only because of the sudden death of its leader. A royal commission condemned his policy, and he was forced to resign the governorship, returning to England in 1676. He wrote *A Discourse and View of Virginia* (1663) and a drama, *The Lost Lady* (1638).

BERKELIUM, a synthetic, radioactive element of at.no. 97, at.wt. 243, and symbol Bk. It does not occur in nature, and is made by bombarding minute amounts of the element americium with alpha particles (helium nuclei) accelerated by a cyclotron. It has a half-life of 4.8 hours. The first preparation of berkelium was announced in January, 1950, by a group of American scientists working under the direction of Glenn Seaborg, at the University of California laboratories at Berkeley, California. See Elements, Chemical.

BERKSHIRE or **BERKS,** county of England, about 20 miles w. of London. Ancient British and Roman remains, including Roman roads and many camps and barrows, are numerous in the county. Of the castles, the principal is Windsor; of the monastic establishments, the abbeys of Abingdon and Reading. Towns of importance are Reading, the capital; Maidenhead; Newbury; and New Windsor. The

county is one of the most beautiful in England, noted particularly for the woodlands in the vicinity of Windsor. About three fourths of the county is under cultivation; its chief trade is in farm and dairy products. Area, 725 sq.m.; pop. (1951 prelim.) 402,939.

BERKSHIRE FESTIVAL, annual music festival held in late July and early August at Tanglewood, an estate of 210 acres in the towns of Lenox and Stockbridge, Mass., in the Berkshire Hills. The festival was organized in 1934 by the American composer and orchestral conductor Henry K. Hadley, who in that year conducted three concerts by sixty-five members of the New York Philharmonic Symphony Orchestra in Stockbridge, Mass. Beginning in 1936 the orchestral concerts of the festival were given by the Boston Symphony Orchestra at Tanglewood under the direction of the Russian-American conductor Serge Koussevitzky. In 1940 a music school, known as the Berkshire Music Center, was established at Tanglewood, also under Koussevitzky's direction. Following Koussevitzky's retirement the French conductor Charles Münch became (1951) director of both the concerts and the music school. The Center offers a six-week course of instruction and has departments in orchestral conducting, choral singing, orchestra and chamber music, ensemble playing, opera, and composition; its various departments give public performances at the festival. In 1955 the total attendance at all the performances of the festival was 136,087.

BERKSHIRE HILLS or **THE BERKSHIRES,** range of hills and mountains in Berkshire Co., W. Massachusetts, famed for their scenery and noted as a resort area. The Berkshires are an extension of the Green Mountains of Vermont. The highest peak, Greylock (3505 ft.), is the highest point in Massachusetts.

BERLE, MILTON, original surname BERLINGER (1908–), American comedian, born in New York City, and educated there in the public schools and at the Professional Children's School. As a child he appeared in many silent motion pictures, and in 1920 he began a successful career as a comedian in vaudeville and made his debut on the legitimate stage. He subsequently was featured in such productions as *Earl Carroll's Vanities*, *Life Begins at 8:40*, and the *Ziegfeld Follies*. Beginning in 1937 he again appeared in motion pictures. Meanwhile, in 1934, he had become a radio performer; later he was the star of his own comedy show. In 1948 Berle made his television debut as master of ceremonies of the *Texaco Star Theatre*. Berle is the author of *Out of My Trunk* (1945).

BERLIN, city of Coos Co., N.H., situated at the junction of the Androscoggin and Dead rivers, about 98 miles N.W. of Portland, Me. Its mills produce wood pulp, paper, and artificial leather, drawing raw materials from the extensive forests in the vicinity. Hydroelectric power is furnished by the Androscoggin R., which drops 200 feet in a single mile in the vicinity of the city, forming Berlin Falls. The city is noted for its winter sports and is the site of one of the most famous ski jumps in the U.S. Pop. (1950) 16,615.

BERLIN, capital of Prussia (1701–1945), of the German Empire (1871–1918), of the German Republic (1918–33), and of the Third Reich (1933–45). After World War II it was under the military occupation and control of France, the United Kingdom, the United States, and the Soviet Union. An important inland port, Berlin is situated on both sides of the Spree River and is linked by canals with the Oder and Elbe rivers. By means of its network of waterways, Berlin is connected with Hamburg, some 180 miles to the N.W., and with the Polish Baltic Sea port of Szczecin (Stettin), about 80 miles to the N.E. The geographical position and transportation facilities of the city make it a great emporium for agricultural products from Poland, the Soviet Union, and Austria. Grain, cattle, spirits, timber, coal, and wool are the chief commodities of trade. The principal industries are iron and steel fabrication, wool weaving, cloth printing, publishing, brewing, and the manufacture of machinery, metalware, chemicals, and china.

From unpretentious beginnings in the 13th century, Berlin grew to be an important community and garrison town in the mark of Brandenburg (q.v.) during the 15th century. About 1500 it became the official residence of the margraves of Brandenburg. During the Thirty Years' War of the 17th century, Berlin suffered great damage. Renewed prosperity was accomplished largely through the efforts of Elector Frederick William (1640–88), who, by completing the construction of a canal from the Spree to the Oder, laid the foundation for Berlin's future commercial greatness. Under Frederick I, Frederick William's successor and the first king of Prussia, Berlin, amalgamated with the nearby towns of Kölln, Friedrichwerder, Dorotheenstadt, and Friedrichstadt, became the capital of a large state. Further impetus was given to the growth of the capital by the encouragement of industries under Frederick II. At his death in 1786 Ber-

lin had a population of about 145,000, an increase of over 135,000 in a hundred years. For a century after the Napoleonic Wars (1799–1815) the growth of Berlin was uninterrupted. As the seat of the government of Prussia and of the German Empire formed in 1871, it became also the national center of the arts and sciences and of vast commercial enterprises.

By the 20th century Berlin was the largest city on the European continent, and the fourth largest in the world. Unter den Linden was one of the finest avenues in Europe. Between its east end and the Spree R. were located the domed Berliner Schloss, the former imperial palace; the national gallery; the old and new museums; the former royal opera house; and the University of Berlin (q.v.). On the Wilhelmstrasse were located most of the government buildings and the foreign embassies. Other famous streets included the Friedrichstrasse, the Leipzigerstrasse, and the Königstrasse.

During World War II, Berlin was heavily and repeatedly bombed from the air by the Allies, and in the closing days of the struggle was severely damaged by artillery fire. On April 21, 1945, Soviet forces reached its outskirts, and on May 2 the Soviet premier Joseph Stalin announced its fall. In June, 1945, Berlin was divided into four zones of occupation (American, British, French, and Russian) and administered by an Inter-Allied governing authority. See GERMANY: *History*. Area of Berlin, 341 sq.m.; pop. (1939) 4,332,242; pop. (1955 est.) 3,417,300.

BERLIN, IRVING, real name ISRAEL BALINE (1888–), American composer of popular music, born in Russia, and educated in the public schools of New York City. He began his musical career as a singing waiter in restaurants and cafés of New York City. In 1911 his song *Alexander's Ragtime Band* established his reputation as a composer of the type of popular song known as ragtime. Berlin was equally successful later in the medium of jazz (q.v.) music. Among the numerous musical comedies and revues for which he wrote the music and lyrics were *Watch Your Step* (1914), *The Century Girl* (with Victor Herbert, 1916), *Yip Yip Yaphank* (1918), the *Ziegfeld Follies* (1919, 1920, 1927), the *Music Box Revue* (1921–23 and 1925), *As Thousands Cheer* (1933), *Annie Get Your Gun* (1946), *Miss Liberty* (1949), and *Call Me Madam* (1950). In 1942, during World War II, he wrote and produced *This Is the Army*, using military personnel only; the proceeds of the production were distributed among various war funds. In 1955 President Dwight D. Eisenhower presented Berlin with a special medal authorized by Congress for his composition of patriotic songs. Berlin wrote music

Ewing Galloway

The Reichstag building, Berlin, which housed the German legislature before World War II

Irving Berlin Music Co.

Irving Berlin

for the motion pictures *Top Hat* (1935), *On the Avenue* (1937), *Second Fiddle* (1939), *Holiday Inn* (1942), *Blue Skies* (1946), *Easter Parade* (1948), and others. Among his many songs which achieved widespread popularity are *Everybody's Doin' It, Oh, How I Hate to Get Up in the Morning, Always, Remember, God Bless America, I'm Dreaming of a White Christmas*, and *Easter Parade*.

BERLIN, CONGRESS OF, an assembly of representatives of Germany, Russia, Austria-Hungary, Great Britain, France, Italy, and Turkey that met in Berlin from June 13 to July 13, 1878, for the purpose of revising the terms of the Treaty of San Stefano (March 3, 1878), which had concluded the Russo-Turkish War (1877–78). After winning the war, Russia by this treaty had imposed on Turkey terms so severe that other European powers, notably Austria-Hungary and Great Britain, alarmed at the growth of the power of Russia and of the independent states created in the Balkans by the treaty, and concerned as to their own interests in the Near East, insisted that the treaty be modified. Count Gyula Andrássy, foreign minister of Austria-Hungary, invited the European powers concerned to meet at Berlin. Prince Otto von Bismarck, Chancellor of the German Empire, presided over the congress.

At the congress the Treaty of San Stefano was virtually abrogated and the Treaty of Berlin was drawn up, with conditions much less favorable to Russia. The new treaty reaffirmed the principle that the status of the Turkish Empire was to be decided by the powers jointly and not unilaterally by any one of them. It also reaffirmed the principle of nationality for the Balkan peoples. Serbia and Montenegro were made independent of Turkey, but the territory granted them by the Treaty of San Stefano was considerably reduced. Bulgaria was divided into three parts, and two of them were placed under Turkish control. Romania gained its independence from Turkey, but Russia acquired the southern Bessarabian region of Romania, for which Romania was compensated by the Dobruja region taken from Turkey. Russia also received the territories of Batum, Kars, and Ardahan. The Turkish provinces of Bosnia and Herzegovina were mandated to Austria.

The results of the Treaty of Berlin were to take from Turkey most of its European territory, to reduce Russian influence in the Near East, and to increase that of Austria-Hungary and Great Britain. The Balkan countries and Russia were not satisfied with what they had obtained by the treaty, and the tensions thus created in the Balkans and the Near East were the cause of much future strife there, and eventually were one of the causes of World War I. See BALKAN WARS; TURKEY: *History*.

BERLIN DECREE. See CONTINENTAL SYSTEM.

BERLINER, EMILE (1851–1929), German-American inventor, born in Hanover. He emigrated to the United States in 1870. In 1877 he invented the loose-contact type of telephone transmitter or microphone, and in the following year perfected the induction-coil transmitter. The gramophone, a talking machine using disk records, was invented by him in 1887; he also developed a method of reproducing disk records. Another of his inventions was an internal-combustion engine with revolving cylinders, which was widely used in airplanes during World War I. In 1925 he introduced the use of acoustic tile and acoustic cells in the construction of sound-reproducing studios.

BERLIN, UNIVERSITY OF, before World War II one of the most important universities in the world. It was established in Berlin in 1809 by King Frederick William III of Prussia to take the place of the University of Halle, inasmuch as the French emperor Napoleon I

had incorporated the town of Halle in the newly formed kingdom of Westphalia. From the beginning the University of Berlin secured men of the greatest ability to fill its professorial chairs; among the scholars connected with the university were the philosophers Johann Gottlieb Fichte and Georg Wilhelm Hegel, the classicist and historian Theodor Mommsen, and the physicist Albert Einstein. The faculties of the university comprised theology, jurisprudence, medicine, and philosophy (arts and science). The university was practically a self-governing body, with corporate freedom and responsibilities. It had police and judicial powers over its student body. During the first part of the 20th century it exchanged professors with Columbia and Harvard universities. In 1940 it had about 8000 students and a faculty numbering 400.

After World War II the university, being in the Soviet sector of Berlin, was operated under communist supervision. Many former students and professors joined the new Free University of Berlin, which was opened in the American sector in 1947. According to estimates, the old university had about 5600 students in 1950. The Free University had about 2000 students in 1951.

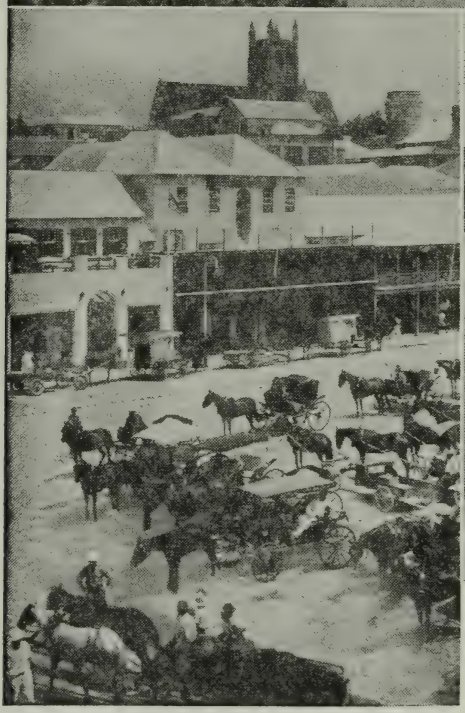
BERLIOZ, Louis Hector (1803–69), French composer, born in La Côte-Saint-André, department of Isère. He was mainly self-educated in music but studied at the Paris Conservatory from 1823 to 1825, principally under the French composer and teacher Jean François Le Sueur. In 1830 Berlioz won the Prix de Rome with his cantata *Le Mort de Sardanapale,* and he spent the next two years studying and composing in Italy. His life subsequently was marked by an unhappy marriage with the Irish actress Henrietta Smithson, and by poverty. In addition to composing and conducting he wrote brilliant music criticism. His music was slow in gaining appreciation in France, but won recognition quickly in other parts of Europe. However, he was elected to the French Academy in 1856. Berlioz was a pioneer of the romantic movement in French music, and was one of the most important innovators in musical history in the art of orchestral instrumentation. His program music (q.v.) foreshadowed the symphonic poem (q.v.) of the Hungarian composer Franz Liszt and the tone poem of the German composer Richard Strauss, and his ideas on orchestration profoundly influenced the subsequent advance made by the romantic school of music in this branch of the art. Berlioz' important works are the symphonies *Symphonie Fantastique* (1830–31), *Harold en Italie* (1834), and *Roméo et Juliette* (dramatic symphony with chorus, 1838–39); the overtures *Les Franc-Juges* (1827–28), *Le Corsaire* (1831), and *Le Carnaval Romain* (1844); the operas *Benvenuto Cellini* (1838), *Les Troyens* (1856–59), and *Béatrice et Bénédict* (1862); the cantata *Huit Scènes de Faust* (1829); the mass *Grand Messe des Morts* (1837); and the oratorio *L'Enfance du Christ* (1850–54). Among his writings are *Traité de l'Instrumentation* (1844) and *Mémoires* (2 vols., 1870).

BERMEJO, river of South America, rising in S.E. Bolivia and flowing through Argentina toward the Paraguay R., which it joins near Nuevo Timbo, a short distance above the junction of the Paraguay with the Paraná R. Its total length is nearly 1300 miles, and it is navigable in its middle course for over half this distance for small steamers at all seasons, and for heavier craft for about six months of the year.

BERMONDSEY, metropolitan borough of London, England, S. and W. of the Thames R. It was the site of a Cluniac monastery founded in the latter part of the 11th century, and was a place of pilgrimage. The modern borough is inhabited largely by families of workers employed on the river docks and in the textile, leather, chemical, and metal industries. Bermondsey is the site of the Herold industrial school for the leather trade, and contains Southwark Park (63 acres). Pop. (1951 prelim.) 60,661.

BERMUDA GRASS, common name for a perennial grass, *Cynodon dactylon,* native to southern Europe, which has been introduced throughout the warmer portions of the world. It is a low, creeping plant, rooting at the joints. In poor soils the leaves are short, and the plant sends up short flower stalks which divide into three to seven slender, divergent spikes. In good soil it is often 1 to 2 feet high. The rootstocks grow rapidly, making a dense sod. Bermuda grass is resistant to heat and drought, and is valued in warm regions for grazing because it remains green after all other grasses are dry. It grows readily in sandy soils and is used in the southern U.S. as a lawn grass. Because of its persistent character, it sometimes becomes a weed in fields of cultivated crops.

BERMUDA ISLANDS, BERMUDA, or **BERMUDAS,** island group, in the North Atlantic Ocean, 580 miles E. of North Carolina and 677 miles S.E. of New York, forming a colony of Great Britain. The Bermudas were discovered by a Spanish navigator, Juan Bermudez, who



Bermuda News Bureau

BERMUDA ISLAND

Top: View of portion of Pembroke Parish.
Left: Front Street, Hamilton.
Above: Cycling on a cross-country road.

was shipwrecked there early in the 16th century. No settlement was established, however, until 1609, when a party of English colonists under the British mariner Sir George Somers, sailing for Virginia, was also shipwrecked in the Bermudas. At first the group was known as the Somers or Summer Islands. A second party of English colonists arrived in 1612. At the close of the American Civil War many colonists particularly Virginians, came from the United States; the islands also received Dutch (Boer) prisoners, sent by the British government, during the Boer War.

The group consists of approximately 360 small islands, of which only 6 are of importance: Bermuda, Great Bermuda, or Main Island; Somerset; Ireland; St. George; St. David; and Boaz. The remainder are rocky islets, the majority of which are uninhabited, and many are without names. Formed of aeolian limestone and coral, the islands are enclosed on the north, west, and south by reefs, mostly under water, and extending at some points 10 miles from the islands, making navigation dangerous. The islands are separated from one another by narrow channels, but in-

clude several coral lagoons, or sounds, of which the most important are Harrington Sound and Castle Harbor; the highest point of land is 260 ft. above sea level. There are no streams nor springs on the islands, and except for a few wells of brackish water the water supply is dependent on rains. Vegetation is luxuriant, however, and the small cultivated area of 1550 acres is very productive. Bananas, potatoes, onions, tomatoes, beets, lily bulbs, and flowers (for the cut-flower market in the United States) are grown. The chief native growths are the Bermuda cedar or juniper, bamboo, palm, and papaw. Hedges of oleander and thickets of mangrove are characteristic features.

The climate is mild, the temperature ranging from 50°to 70° F. in winter, with a maximum of 87° in summer; frosts are unknown. The ocean winds are tempered by the Gulf Stream, but when south winds prevail there is much humidity, and severe thunderstorms are frequent. The picturesque scenery and the healthful and equable climate make the islands a popular resort for Americans. Food supplies are chiefly imported from the United States and Canada, and the greater part of the exports of the islands are to those countries. Imports in 1952 were valued at £11,379,553; exports at £1,485,506. The islands are well supplied with telegraph, telephone, post-office, and other facilities. Because of its location the group is of considerable strategical importance. It is the winter naval station for the British North Atlantic and West Indian squadrons. In 1940, during World War II, sites on the island were leased to the United States for naval and air bases for ninety-nine years, in exchange for which Great Britain received fifty over-age destroyers of the United States Navy.

Hamilton, on Bermuda Island, is the capital and chief town. Next in importance is St. George, on St. George Island. Administration of the group, a crown colony since 1684, is in the hands of a governor, appointed by the crown, who is assisted by two councils, also appointed by the crown, and by an assembly of thirty-six elected members. Education is compulsory, and since 1949 has been free for children between the ages of seven and thirteen. Total area, about 22 sq.m.; pop. (1956 est.) 42,000.

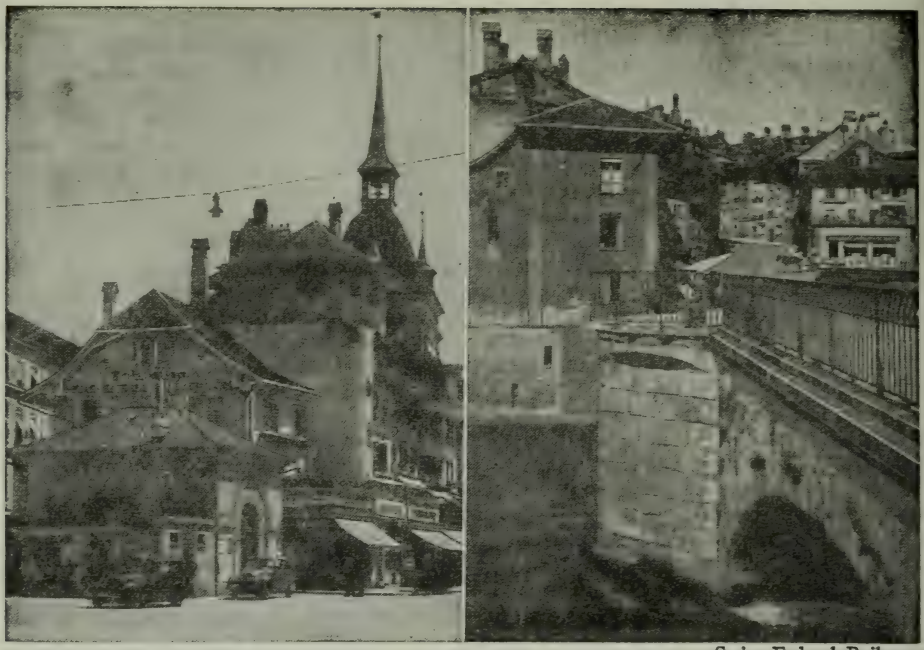
BERN or **BERNE**, canton of Switzerland, occupying the W. central and N.W. sections of the country and bordering France on the N. and W. It is the most populous and second largest of the Swiss cantons. Topographically, the canton falls within the province of two great mountain systems, the Alps in the S. and the Jura Mts. in the N.W. The highest summit of the Bernese Alps, the Alpine range traversing the canton, is Finsteraarhorn (14,026 ft.). Jungfrau (13,688 ft.) is the next-highest peak. A number of other summits in the Alpine section of the canton are over 10,000 ft. in height. Elevations in the Jura section are considerably lower, attaining a maximum height of 5278 ft. Between the Bernese Alps and the Jura is an extensive region, known as the Midlands, comprising the basin of the Aare R., the chief stream of the canton. The lake of Thun, broad valleys, and the foothills of the Bernese Alps are among the topographic features of the Midlands.

The economy of the canton is basically agricultural. Cattle breeding, dairy farming, and cheese making are the principal industries in the Alpine section. The tourist trade is also an important source of wealth in this section, which is celebrated for its scenic beauty. Among the major crops, grown mainly in the Midlands, are wine grapes, grain, and various fruits. Watchmaking is the leading manufacturing industry of the canton. Other noteworthy industries are iron mining, wood carving, and the manufacture of pottery, tile, textiles, and metal products.

The language spoken by a majority of the inhabitants is German, and most of the population are Protestants. In the Jura region the predominant language is French. Many of the French-speaking Bernese are Roman Catholics. For administrative purposes the canton is divided into thirty districts, each administered by a prefect elected by popular vote. The city of Bern (q.v.), capital of Switzerland, is the administrative center of the canton. Area, 2658 sq.m.; pop. (1950) 801,943.

BERN or **BERNE**, capital of Switzerland and of the canton of Bern (q.v.), about 59 miles S.W. of Zurich. It is situated on a lofty promontory surrounded on three sides by the Aare River. The old battlements of the city, converted into promenades, command a magnificent view of the Alpine scenery.

The city was founded in 1191 and made a free imperial city in 1218. Between 1298 and 1339 it successfully resisted attacks by Rudolf of Hapsburg, his son Albert, and Louis of Bavaria, and became an independent state. The city joined the Swiss Confederation in 1353. The "Disputation of Bern" between Catholics and Reformers in 1528 prepared the way for acceptance of the Reformed doctrine (see REFORMATION). At the height of its power



Swiss Federal Railways

Left: An old tower, called "Dutch-tower," in the city of Bern.
Right: View of the same city, showing a bridge built in the 14th century.

Bern ruled over one third of Switzerland. The French invasion of 1798 overthrew the aristocratic regime, and during the 19th century the power of the church was limited, the constitution liberalized, and the principle of the referendum adopted. In 1885–86 Bern was the site of a conference held to formulate an international agreement on copyrights; the agreements, as well as the meeting itself, are known as the Bern Convention (see COPYRIGHT).

Because of the tradition that many bears were killed on the day Bern was founded, the bear is the emblem of the city, and a bear pit, maintained since 1513, is still one of the notable sights. Principal public buildings are the houses of Parliament; a Gothic cathedral, begun in 1421 and finished in 1611; and the town hall, dating from 1406. The University of Bern, founded in 1834, has departments of law, medicine, philosophy and science, and theology. In 1952–53 the faculty numbered 246; the student body about 2395. Bern Library, which now includes the university library, contains many manuscripts and rare books. Bern has four museums, containing, respectively, collections of Swiss art, and exhibitions dealing with history, natural history, and Alpine subjects.

The principal activities carried on in the city are governmental and administrative; various international organizations, notably the International Postal Union, have headquarters there. Its industrial activity is limited to the production of fine scientific instruments, textiles, machinery, and chocolates. Two great annual fairs are held at Bern, and it has a large horse and cattle market. Pop. (1950) 146,490.

BERN, DIETRICH VON. See THEODORIC.

BERNADETTE OF LOURDES, SAINT, real name BERNADETTE SOUBIROUS (1844–79), French nun, born in Lourdes. At the age of fourteen she claimed that she had had eighteen visions of the Virgin, and that the Virgin had imparted miraculous powers of healing to the waters of a spring near a grotto in Lourdes. The visions were declared authentic by the Roman Catholic Church, and the Lourdes grotto became a shrine for pilgrims. In 1866 Bernadette joined the Sisters of Charity, a group of women bound by annual vows to religious and charitable work, at Nevers, France. In 1877 she became a nun. She was beatified in 1925 and canonized in 1933. Her feast day is May 12.

BERNADOTTE, JEAN BAPTISTE JULES. See CHARLES XIV JOHN.

BERNARD, CLAUDE (1813–78), French physiologist, born in Saint-Julien. He studied medicine at the Collège de France, and worked there under the French physiologist François Magendie (1783–1855), whom he succeeded as professor of experimental physiology in 1855. In 1854 he accepted the new chair of physiology at the Sorbonne, but relinquished the post in 1868 to accept a professorship established by Emperor Napoleon III at the Jardin des Plantes.

Bernard's specific discoveries in physiology include: the function of the pancreas and its importance in the digestion of fats; the importance of the liver in the transformation, storage, and use of sugar in the body; and the existence of the vasomotor function and many other activities of the sympathetic nervous system. For these three discoveries he received grand prizes, in 1849, 1851, and 1853 respectively, from the Académie des Sciences, of which he became a member in 1854. In 1868 he became a member of the Académie Français. On his death he was given a public funeral, an honor never before bestowed by the French government on a scientist. Yet only after his death was his full worth generally appreciated. He was one of the great synthesizers and philosophers of science, putting physiology on a rational basis. Such 20th-century philosophers as the Englishman Alfred North Whitehead hailed him as one of the great thinkers of all time. Among his many writings are *Physiologie Générale* (1872), *Introduction à la Médicine Expérimentale* (1876), and *La Science Expérimentale* (1878).

BERNARD, TRISTAN, real name **PAUL BERNARD** (1866–1947), French novelist and playwright, born in Besançon. He is known principally for his light comedies, including *L'Anglais tel qu'on le Parle* (1899), *Triplepatte* (1906), *Le Petit Café* (1911), *Le Sexe Fort* (1917), and *Un Perdreau de l'Année* (1926). His novels include *Le Voyage Imprévu* (1928) and *Hirondelles des Plages* (1929).

BERNARDIN DE SAINT-PIERRE, JACQUES HENRI (1737–1814), French author, born in Le Havre. After a period spent as an engineer and in travel, he held a government post in Île de France (present-day Mauritius) from 1768 to 1771. On his return to France he became interested in the philosophic ideas of Jean Jacques Rousseau (q.v.), and they influenced his writings. Saint-Pierre's works are characterized by imagination, sentiment, and love of nature, as opposed to the emphasis on wit and external form which characterized most of the French literature of his time. His work foreshadowed the romantic movement in French literature. In 1795 Saint-Pierre was elected to the Académie Français. He is the author of *Voyage à l'Ile de France* (1773); *Études de la Nature* (1784–88); *Paul et Virginie* (1788), generally regarded as his masterpiece; *La Chaumière Indienne* (1790); and *Harmonies de la Nature* (1796).

BERNARDINES. See CISTERCIANS.

BERNARDINO OF SIENA, SAINT (1380–1444), Italian Franciscan monk, born in Massadi-Carrara. In 1402 he became a member of the Franciscan Order, and subsequently preached throughout Italy. He was appointed vicar-general for Italy in 1438. Bernardino founded the *Fratres de Observantia*, which established more than three hundred monasteries in Italy. He was canonized in 1450, and his feast day is May 20.

BERNARD OF CLAIRVAUX, SAINT (1091–1153), French ecclesiastic, born in Fontaines, near Dijon. In 1113 he became a monk in the Cistercian monastery of Citeaux, a small village S. of Dijon, and in 1115 became abbot of a monastery of the same order at Clairvaux, N. of Dijon. Under his rule the monastery at Clairvaux became the most prominent of the Cistercian order. Reputed miracles and the eloquent preaching of Bernard attracted numerous pilgrims. Between 1130 and 1145 over ninety monasteries were founded under the auspices of the one at Clairvaux. Bernard's influence in the Catholic Church became international. He is reputed to have established the rule of the order of Knights Templars (q.v.) and in 1128 obtained the Church's recognition of the order. In the contest (1130–38) between Innocent II and Anacletus II for the papal throne, Bernard was instrumental in Innocent II's victory. In 1146, at the command of the pope, Bernard began his preaching of the Second Crusade to the Holy Land. His sermon at Vezelay aroused enthusiasm throughout France; King Louis VII was persuaded to join the crusade, and subsequently Bernard gained recruits for it in northern France, Flanders, and Germany. Its failure was a great blow to Bernard and hastened his death. He was canonized in 1174; his feast day is August 20.

Bernard was an uncompromising opponent of heresies and of rationalistic theology, such as that of the French philosopher and theologian Peter Abelard (q.v.). He wrote numerous sermons and letters, and many hymns, some of which are still sung in both Catholic and Protestant churches. Important among

Sarah Bernhardt (painted by Bastien-Lepage)

his works are *De Diligendo Deo* (1126) and *De Consideratione* (1148).

BERNARD OF MENTHON, SAINT (923–1008), Roman Catholic priest, born in Menthon, Savoy, France. He became archdeacon of Aosta, in the Italian Alps, and spent most of his life spreading Christianity among the people of the Alpine regions. About 962 he founded hospices of the Augustinian Order (see AUGUSTINIANS) at the Great St. Bernard Pass in the Alps between Switzerland and Italy, and at the Little St. Bernard Pass between France and Italy (see SAINT BERNARD). He was canonized in 1681 and his feast day is June 15.

BERNE. See BERN.

BERNHARDI, FRIEDRICH VON (1849–1930), German military leader and writer, born in St. Petersburg (now Leningrad), Russia. He served in the Franco-Prussian War, and from 1891 to 1894 was at Bern, Switzerland, as military attaché; later he went to Berlin as head of the history department of the Grand General Staff. Bernhardi was general of cavalry and commander of the 7th Army Corps from 1907 to 1909, retiring then to write on military subjects. His *Germany and the Next War* (1912) attracted international attention. In it he contended that his country could acquire its "place in the sun" by waging ruthless war. At the outbreak of World War I he was again given command of an army corps and served with distinction. Among his works written in English are *Cavalry in War and Peace* (1910), *On War of Today* (1914), *Britain as Germany's Vassal* (1914), and *The Heroic Fight of Germany, 1914–18* (1921).

BERNHARDT, SARAH, original name ROSINE BERNARD (1844–1923), French actress, born in Paris, and reared in a convent. She entered the Paris Conservatory in 1858, and in 1862 made her debut as the Greek tragic heroine Iphigénie at the Comédie-Française. She attracted so little notice that she soon left that company, and she was unsuccessful also in burlesque at the Gymnase and Porte-St.-Martin theaters, in Paris. In 1867 she played minor parts at the Odéon Theater, Paris, and became famous by her impersonation of the queen of Spain in *Ruy Blas,* and of Zanetto in *Le Passant,* by the French dramatist François Coppée. She was recalled to the Comédie-Française in 1872, and after 1879 appeared annually, with marked success, in London, notably in *Adrienne Lecouvreur* and *Frou-Frou.* She made successful tours in North and South America, adding *La Dame aux Camélias* to her repertoire, and in Italy, Russia, and other countries, becoming the best-known actress of her time.

With her appearance in Victorien Sardou's *Fédora* began her long association with that author, who wrote for her *Théodora, La Tosca,* and (in collaboration with the French dramatist Émile Moreau) *Cléopâtre.* She visited America in 1886–87 and 1888–89, and between 1891 and 1893 made a tour of the world. On her return to Paris she became owner of the Théâtre de la Renaissance, and several years later leased the Théâtre des Nations (renamed Théâtre Sarah Bernhardt), appearing in the leading roles in Edmond Rostand's *L'Aiglon* and a French version of William Shakespeare's *Hamlet.*

In 1914, at the age of seventy, she suffered the amputation of a leg. She refused to abandon the stage, however, and during World War I she played before audiences of soldiers close to the lines of battle, and in America and England. She continued to produce plays and act almost continuously until her death. In addition to her extraordinary dramatic gifts she showed talent in sculpture, painting, and writing, and is the author of two plays and a volume of memoirs (1907). She was made a member of the Legion of Honor in 1914.

BERNICE. See BERENICE.

BERNINI, GIOVANNI LORENZO (1598–1680), Italian sculptor, architect, and painter, born in Naples. He began sculpturing at the age of eight and in his eighteenth year finished his celebrated group "Apollo and Daphne". Pope

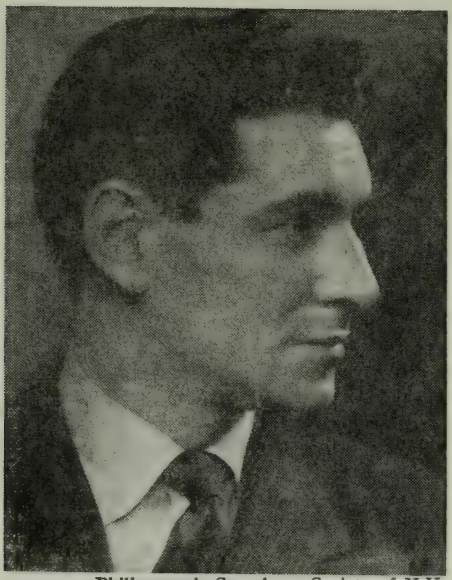
Urban VIII employed him to produce designs for the embellishment of St. Peter's at Rome, and his greatest achievement in architecture is its colossal colonnade. In 1663 he accepted the invitation of King Louis XIV of France and traveled to Paris, but, his design for the Louvre being deemed inferior to that of the French architect Claude Perrault (1613–88), he confined himself entirely to sculpture. Bernini's visit, however, proved highly remunerative. Richly laden with gifts, he returned to Rome. For fifty years he dictated the artistic taste and achievements of the papacy, and his conceptions dominated the sculpture of Europe for a century.

BERNOULLI, name of a family, originally of Antwerp and later of Frankfort and Basel, distinguished in mathematics and physics. The three most celebrated of its eight notable members were the following. **1.** JAKOB or JACQUES (1654–1705), mathematician, born in Basel, where he became professor at the university. He and his brother Johann were among the first to understand and use the new method of the German mathematician Gottfried Wilhelm von Leibniz. One of a famous group of problem solvers, he solved Leibniz' problem of the isochronous curve. He wrote an essay on comets suggested by the comet of 1680. **2.** JOHANN or JEAN (1667–1748), born in Basel, brother of Jakob, whom he succeeded in the Basel professorship. He was without a rival in mathematics in Europe in his day. He proposed the problem of the minimum line between two points on a given surface, and was a pioneer in the work of constructing an exponential and an integral calculus. **3.** DANIEL (1700–82), son of Johann, born in Groningen, Holland. He became professor of mathematics at St. Petersburg (now Leningrad) and afterward of experimental philosophy and of anatomy and botany at the universities of Groningen and Basel. He is credited with developing the first kinetic theory (q.v.) of gases, and formulating the fundamental law of fluid mechanics (see BERNOULLI'S PRINCIPLE).

BERNOULLI'S PRINCIPLE, in physics, a law describing the action of pressures in moving fluids. As originally formulated by the Swiss physicist Daniel Bernoulli in 1738, the law states that the flow of a liquid or a gas through a tube reduces the pressure at right angles to the line of motion and, if the fluid flows through a constriction in the tube, its speed increases, thus further reducing the pressure. The law also applies to flowing fluids which are constrained in other ways than by the walls of a tube. For example, air flowing over the wing of an airplane is constrained by the wing, and the air pressure is thus reduced in the direction of the wing. Since the wing is designed so that air flows more rapidly over its upper surface than over the lower, there is greater reduction in pressure over the upper surface, and the difference in pressure furnishes sufficient lift to sustain the airplane. Similar considerations explain the curved flight of a ball which has "spin", and the ability of a small, light ball to remain balanced at the top of a fountain. The venturi tube (q.v.) and the pitot tube used in instruments for measuring flow and pressure of fluids also utilize this principle. See FLIGHT, THEORY OF.

BERNSTEIN, HENRY LÉON GUSTAVE CHARLES (1876–1953), French dramatist, born in Paris. In 1940, after a highly successful career in his native country, he emigrated to the United States, and a year later the

"Apollo and Daphne," by Giovanni Bernini



Philharmonic Symphony Society of N.Y.
Leonard Bernstein

anti-Semitic, German-dominated government which ruled France during part of World War II deprived Bernstein, a Jew, of his French citizenship. Bernstein is the author of a number of comedies, among which are *Le Détour* (1902) and *Le Bercail* (1904); several psychological dramas, including *Le Secret* (1913) and *La Galerie des Glaces* (1924); and a considerable number of dramas noted for strong plot rather than deep character study. Among these dramas, which are characterized by violent situations and unconventional themes, are *Le Voleur* (1906), *Samson* (1907), *Judith* (1922), *Mélo* (1929), *Espoir* (1934), *Le Voyage* (1937), *Eldire* (1940), and *Rose Burke* (1942).

BERNSTEIN, Leonard (1918–), American composer, conductor, and pianist, born in Lawrence, Mass., educated at Harvard University, and trained in music at the Curtis Institute of Music, Philadelphia, Pa. At the Curtis Institute he studied conducting under the Hungarian, Fritz Reiner. In 1940 he became a pupil of the noted conductor Serge Koussevitzky, and continued his studies of orchestral conducting at the Berkshire Music Center, Tanglewood, Mass. In 1943 he made a dramatic debut as a conductor when he was called on short notice to lead the Philharmonic Symphony Orchestra in New York City in place of Bruno Walter, who had fallen ill. For three seasons, beginning in 1945, he was music director of the New York City Symphony. His growing renown as guest conductor of many of the nation's best orchestras opened the way to similar performances in London and Prague in 1946. Bernstein made a number of European tours, conducting leading orchestras, and he conducted at both the Edinburgh and Holland festivals. In 1948–49 he was music director of the Israel Philharmonic Orchestra, and during its American tour in 1951 he and Koussevitzky served as conductors. Bernstein joined the faculty of the Berkshire Music Center in 1946, and succeeded Koussevitzky as head of the conducting department. From 1951 to 1956 he was professor of music and head of the creative-arts department at Brandeis University, Waltham, Mass. He became one of the two principal conductors of the New York Philharmonic-Symphony Orchestra in 1957. Besides a sonata for clarinet and piano, the song cycles *I Hate Music* and *La Bonne Cuisine* (1946), and piano pieces, he wrote the symphonies *Jeremiah* (1942) and *Age of Anxiety* (1949); the ballets *Fancy Free* (1944) and *Facsimile* (1946); the scores of the musical comedies *On the Town* (1945), *Wonderful Town* (1953), and *West Side Story* (1957); five pieces for brass (1947); incidental music for the plays *Peter Pan* (1950) and *The Lark* (1955); the opera *Trouble in Tahiti* (1952); and the score of the comic operetta *Candide* (1956).

BERNSTORFF, Johann-Heinrich, Count von (1862–1939), German diplomat, born in London, England. Bernstorff entered the German diplomatic service in 1889, and in the same year was appointed attaché at the German embassy in Constantinople (now Istanbul), Turkey. From 1902 to 1906 he served as councilor to the German embassy in London, England, and from 1906 to 1907 was the German consul general at Cairo, Egypt. In 1908 Bernstorff was appointed German ambassador to the United States; he held this post during World War I, attempting without success to strengthen German-American relations, until 1917, when diplomatic relations between the United States and Germany were severed. From 1917 to 1918 he was ambassador to Turkey, and from 1921 to 1928 was a member of the German Reichstag. During the postwar period Bernstorff became known as an advocate of world peace; he was a delegate to the League of Nations and chairman of the educational organization known as the German League of Nations Union, and also represented his country at international disarmament conferences between 1929 and 1931. In 1933,

after the rise to power of the German dictator Adolf Hitler, he became a voluntary exile in Switzerland. Bernstorff's writings include *My Three Years in America* (1920) and *Memoirs of Count Bernstorff* (1936).

BERCŒA, name of three cities of antiquity. **1.** A city of ancient Syria, on the site of modern Alep. In 301 B.C., following the death of Alexander the Great and during the struggle among his generals for his empire, the Macedonian general Seleucus Nicator took the ancient city, which had been founded before 2000 B.C., and renamed it Berœa after the Macedonian city of the same name. The city became a Roman possession in 64 B.C., and was conquered by the Persians in 611 A.D. In the 7th century it was seized by the Arabs, who renamed it Haleb (whence the modern Alep). **2.** A town of ancient Palestine, about 10 miles N. of Jerusalem on the site of modern Bire (or Bireh), Arab Palestine. Berœa was the Beeroth mentioned in the Old Testament in the Books of Joshua, 2 Samuel, Ezra, and Nehemiah. At Berœa, in 160 B.C., the Jewish leader Judas Maccabæus defeated the Syrian army of Nicanor. **3.** A city of ancient Macedonia, on the site of the modern town of Verroia or Veroia, Greece, about 40 miles W.S.W. of Salonika. Berœa was probably founded in the 5th century B.C. It is mentioned in the New Testament, in Acts 17:10–12, as a place where the Apostle Paul and his disciple Silas "went into the synagogue of the Jews" to preach, and founded a Christian community. In the first century A.D. Berœa was the most populous city of Macedonia; in the 9th century it was destroyed by an earthquake.

BERRY, Martha McChesney (1866–1942), American educator, born near Rome, Ga., and educated in private schools. In 1902 she opened a school in a log cabin, and began to teach children of the back-country regions of the Georgia mountains. Her success led her to establish, at Mount Berry, Ga., the Berry Schools for Mountain Children, which she maintained for the remainder of her life.

BERSERK or **BERSERKER** (Icelandic, *berserke*; related to AS. *bera*, "bear"; *serc*, "shirt"; referring to the skins of animals worn by ancient heroes), in Scandinavian mythology, the name of a hero who went into battle without armor, his fury serving as a coat of mail. He had twelve sons who inherited, along with his warlike fury, the name "Berserk". Among early Norse people the name was applied to a combatant whose love of fighting induced a frenzied state called the "berserk's course", in which he was dangerous to both friend and foe. Later the title was given to companies of hard fighters who were retained as bodyguards of mythological Scandinavian leaders.

BERTHELOT, Pierre Eugène Marcelin (1827–1907), French chemist and public official, born in Paris, and educated at the Collège Henri IV. He received his doctorate there in 1854, presenting a remarkable thesis establishing the structure and synthesis of fats, the constitution of glycerin, and the nature of polyhydric alcohols. In 1856 he synthesized methane, the first of the hydrocarbons to be prepared in the laboratory from its elements. He contributed to the knowledge of almost every class of organic chemical compounds, and in particular did important work on explosives and dyes, and on the heat produced by chemical reactions. He became professor at the École de Pharmacie in 1859 and at the Collège de France in 1865. He was elected a member of the French Academy of Sciences in 1873, and succeeded the French chemist Louis Pasteur as its perpetual secretary in 1889. Berthelot was made inspector general of public education in 1876; was elected senator for life in 1881; and held the ministry of public instruction in 1886–87 and of foreign affairs in 1895–96. Among his works are *Les Origines de l'Alchimie* (1885), *Traité Pratique de Calorimétrie Chimique* (1893), and *Recherches Expérimentales* (1901).

BERTHOLLET, Comte Claude Louis (1748–1822), French chemist, born in Talloire, Savoy, and educated at the University of Turin. In 1780 he became a member of the French Academy of Sciences, and in 1794 professor at the École Normale in Paris. In 1798 he was one of the savants who accompanied the French soldier and statesman Napoleon Bonaparte to Egypt and there formed an institute on the pattern of the Institut National in France. Napoleon made him a senator in 1804, later a grand officer of the Légion d'Honneur, and under the empire a count; nonetheless, he voted for Napoleon's deposition in 1814. King Louis XVIII created him a peer.

In 1784 Berthollet became superintendent of dyeing processes for the French government, and in 1785 proposed the use of chlorine as a bleaching agent. He was one of the original adherents of the "antiphlogistic" theory of the French chemist Antoine Lavoisier (see Phlogiston), although he opposed Lavoisier's erroneous theory that oxygen is the fundamental acidifying principle. In 1787, with Lavoisier and others, Berthol-

let devised a new system of chemical nomenclature which is the basis of the system currently used. He made important contributions to the chemistry of explosives and the metallurgy of iron. He also formulated important generalizations concerning chemical equilibrium, stressing the importance of the relative masses of the reactive substances. This concept was put forth in his most significant work, *Essai de Statique Chimique* (2 vols., 1803).

BERTHOLLETIA. See BRAZIL NUTS.

BERTILLON, ALPHONSE (1853–1914), French statistician and criminologist, born in Paris, and privately educated. He became head of the identification department of the Prefecture of Police of the Seine, in Paris, and in 1879–80 devised a system for identifying criminals (see BERTILLON SYSTEM). He was made a chevalier of the Legion of Honor. His writings include *La Photographie Judiciaire* (1890), *De la Reconstitution du Signalement Anthropométrique au Moyen des Vêtements* (1892), *Identification Anthropométrique* (1893), *La Comparaison des Écritures et l'Identification Graphique* (1897), and *Anthropologie Métrique et Photographique* (with A. Chervin, 1909).

BERTILLON SYSTEM, a scientific method for identification of people, and especially of criminals, devised in 1879–80 by the French criminologist Alphonse Bertillon. The system embraces records of anthropometric measurements and personal characteristics, such as color of eyes, scars, and deformities. The following measurements are taken: (1) *body*: (*a*) height standing, (*b*) reach from finger tips to finger tips, (*c*) trunk and head or height sitting; (2) *head*: (*a*) length and width, (*b*) length and width of right ear; (3) *limbs*: (*a*) length of left foot, (*b*) left middle finger, (*c*) left little finger, (*d*) left forearm. They are recorded on cards and classified according to the length of the head. The system was inaugurated in the United States in 1887.

Bertillon measurements are difficult to take with uniform exactness, and physical dimensions are liable to change through growth or surgery. For these reasons fingerprinting, photography, and other methods have for the most part superseded the Bertillon system as the principal means of identification in American and European police systems.

BERWICK or **BERWICKSHIRE,** maritime county of Scotland, bounded on the N. by East Lothian, on the E. by the North Sea, on the S. by Northumberland and Roxburgh, and on the W. by Midlothian. Physiographically, the county may be divided into three districts: Lammermuir, the highlands in the north; Lauderdale, the valley of the Leader R. in the west; and the Merse, the largest district, in the southeast. The principal towns (with population figures, 1951 prelim.) are Duns, the county seat (2028), Eyemouth (2269), Coldstream (1294), Ayton (1483), and Earlston (1761). The coast, 20 miles long, is rocky. About 6 miles N.W. of Eyemouth, on a rocky promontory, the ruins of Fast Castle are located, and 4 miles farther, at Cockburnspath, is a ruined fortress. These are believed to be, respectively, the *Wolf's Crag* and *Ravenswood* of the Scottish author Sir Walter Scott's *The Bride of Lammermoor.* Other interesting ruins are those of Hume Castle and Dryburgh Abbey. Agriculture is the principal occupation, and there are excellent salmon and coastal fisheries. Manufactures include woolens and paper. Area, 457 sq.m.; pop. (1951) 25,086.

BERWICK, JAMES FITZ-JAMES, DUKE OF (1670–1734), natural son of the duke of York (later King James II of England), born in Moulins, France, and educated in France. The title Duke of Berwick was conferred on him in 1687. In 1689 he accompanied his father on the latter's Irish expeditions, undertaken to regain the British throne, and he served in various campaigns on the Continent. In 1702 he became a French subject, and some years later was created a marshal of France and sent at the head of an army to Spain, where he secured the throne for Philip V by the victory of Almansa (1707). For this service he was made a French peer by King Louis XIV of France, and duke of Liria and Xerica by King Philip V of Spain. In 1733 he received command of a French army intended to cross the Rhine River during the War of the Polish Succession, and was killed at the siege of Philipsburg. Berwick is considered one of the greatest strategists of his time.

BERWICK UPON TWEED, seaport and municipal borough of Northumberland, England, at the mouth of the Tweed River, on the border of Scotland. The borough, sometimes called *Berwick Bounds,* covers 8 sq.m. and includes the towns of Tweedmouth and Spittal. The towns are built on the lower slopes of the hills which rise from both banks of the Tweed, and are connected by three arched bridges.

The authentic records of Berwick begin in the reign of Alexander I of Scotland, in the 12th century, when it was the principal sea-

port of Scotland. In 1296 Edward I of England captured the town and, after massacring 8000 of the inhabitants, made it a free borough. Captured by the Scottish king Robert I (the Bruce) in 1318, it was retaken by King Edward III in 1333 The town was captured and held for brief intervals by the Scots during the next century, but it passed finally into the possession of the English in 1482. It was administered as a separate county until 1885 and, although now joined to Northumberland, still retains its courtesy title of "county of itself".

Berwick upon Tweed is unusual in that it is completely encircled by its old battlements. Among its notable buildings are the town hall, with a 150-foot spire, which dates from 1760, and the Corn Exchange, built in 1858. The principal occupations are fishing, coal mining, and ironworking. Exports are largely coal and fish; imports are mainly timber and fertilizers. Pop. (1951 prelim.) 12,550.

BERYA or **BERIYA** or **BERIA,** LAVRENTI PAVLOVICH (1899–1953), Soviet public official, born in Tbilisi, Russia. He joined the Bolshevik wing of the Social Democratic Party in 1917 and participated in the Russian Revolution, chiefly as an underground soldier in the Caucasus. Subsequently he served in the Cheka and later headed the Caucasus party organization. Berya was called to Moscow in 1938 and appointed head of the Commissariat for Internal Affairs (N.K.V.D.), known after 1946 as the Ministry for Internal Affairs (M.V.D.). In this capacity he controlled the secret-police organization (see G.P.U.). He was a deputy premier after 1941 and in 1946 he became a member of the Presidium of the Supreme Soviet and of the Politburo, the highest body of the Communist Party of the U.S.S.R. After party organizational changes effected in 1952 he was chosen a member of the newly created Presidium, which assumed the functions of the Politburo and other top party committees. As the result of a reorganization of leading organs of the party and government in March, 1953, following Premier Joseph Stalin's death, he emerged as second in command (after Stalin's successor Georgi Malenkov) in the Soviet hierarchy. Berya was arrested in July, 1953, on charges of "criminal and anti-state activities". On Dec. 24 the Soviet government announced that he and six accomplices had been convicted of high treason and executed.

BERYL, a common mineral and, in certain color modifications, a valuable gem material. It has hardness 8 and sp.gr. about 2.8. Chemically it consists of beryllium aluminum silicate, and it is the chief commercial ore of beryllium (q.v.). Pure beryl is colorless and transparent. Emerald (q.v.), one of the most valuable of gems, is a variety colored green by minute amounts of chromium. Aquamarine (q.v.), also a gem stone, is a blue beryl more common than emerald. Golden beryl and morganite or rose beryl are less valuable. Colorless beryl is occasionally used as a gem under the name goshenite. Beryl has a vitreous luster and little fire or brilliancy, and so its value depends principally on hardness, transparency, and color.

Beryl crystallizes in the hexagonal system, and crystals weighing over a ton are not uncommon. These crystals, however, are invariably opaque and imperfect, and therefore valueless as gem material. Large, transparent crystals of the colored varieties are occasionally found.

BERYLLIUM, an element, of at.no. 4, at.wt. 9.02, m.p. 1287°C. (2349°F.), sp.gr. 1.8, and symbol Be. It was named for the mineral beryl. The element is sometimes called glucinum, symbol Gl (Gr. *glykys*, "sweet", because of the taste of its compounds). It is a gray metal, harder and more brittle than the other common light metals, aluminum and magnesium. It was first identified as an element and named by the French chemist Louis Nicolas Vauquelin (1763–1829) in 1798; the pure metal was first isolated in 1828.

Beryllium tarnishes only slightly in air, becoming covered with a thin layer of oxide. Beryllium compounds are generally white (colorless in solution) and show great similarity in chemical properties to the corresponding compounds of aluminum, although the valence of beryllium is 2 and the periodic law would indicate a closer relationship to magnesium. This similarity makes it difficult to separate beryllium from the aluminum which is almost always present in its ores. Beryllium is not as common as aluminum or magnesium, though far more common than such metals as silver. It is about as heavy as magnesium (aluminum is half again as heavy). It has not been used as a structural metal either in pure form or in alloys with other light metals. Minute amounts of beryllium are added to aluminum casting alloys to improve melting and casting characteristics The principal use for beryllium is in alloys with copper. A typical alloy contains 97.7 percent copper, 0.3 percent cobalt, and 2 percent beryllium. Such an alloy, comparatively soft when made, can be formed to the

desired shape and then, by a simple heat treatment, can be hardened and its tensile strength increased to 170,000 lbs. per sq.in. This strength is comparable to that of alloy steel. Alloys of beryllium with nickel instead of copper are even stronger. Pure beryllium is of importance in the field of atomic energy as a moderator and reflector in nuclear reactors.

BERZELIUS, Baron Jöns Jakob (1779–1848), Swedish chemist, born in East Gothland. While studying medicine at the University of Uppsala, he became interested in chemistry. After practicing medicine and lecturing, he was appointed professor of botany and pharmacy at the University of Stockholm in 1807, and was professor of chemistry at the Caroline Institute in Stockholm from 1815 to 1832. He became a member of the Stockholm Academy of Sciences in 1808, and in 1818 became its permanent secretary. King Charles XIV of Sweden made him a baron in 1835.

Berzelius' researches extended into every branch of chemistry and were extraordinary for their number and accuracy. He discovered three chemical elements (cerium, selenium, and thorium) and was the first to prepare several others in pure form. He introduced the term "catalyst" into chemistry and was the first to elaborate upon the nature and importance of catalysis (q.v.). He introduced the present system of chemical formulation (using one- or two-letter abbreviations for each element, yielding symbols such as the familiar H_2O for water). Berzelius was primarily responsible for the theory of radicals (the concept that a group of atoms, such as the sulfate group, can act as an entity through a series of chemical reactions). He developed an elaborate electrochemical theory, which, though greatly modified, was of fundamental importance in the development of concepts of chemical affinity. All of his theoretical work was supported by elaborate experimental measurement. His greatest analytical achievement was the measurement of atomic weights, a laborious experimental problem which he carried out with extraordinary accuracy.

BES, in ancient Egyptian religion, a god of pleasure. He protected his worshipers against witchcraft and evils resulting from omens, drove away pain and sorrow, and presided over childbirth. He was represented as a grotesque, large-headed, goggle-eyed, bearded dwarf, clad in an animal skin and wearing a feathered crown. Archeologists found representations of him on ancient Egyptian ointment vases, mirrors, and other toilet articles; and on temples dating from the 7th century B.C. His image was used as an amulet in the Greco-Roman world until medieval times.

BESANÇON, capital of the department of Doubs, France, situated on both sides of the Doubs R., about 47 miles E. of Dijon. As *Vesontio* it was the principal town of the Sequani, a Celtic tribe of ancient Gaul; in 58 B.C. it was occupied by the Romans under the soldier and statesman Julius Cæsar. Several streets in Besançon still bear Roman names. In the neighborhood are found ruins of a triumphal arch dedicated to the victories of the Roman emperor Marcus Aurelius, an aqueduct, and an amphitheater. Among later structures are the cathedral of St. Jean, some of the main portions of which date from the 11th century; the Palais Granvelle, completed in 1540; and the Hôtel de Ville and other buildings dating from the 16th century. The University of Besançon, founded in 1485, offers courses in science, law, and letters; its student body in 1953 numbered 1037.

A large percentage of the watches and clocks made in France is manufactured in the city. Other manufactures include rayon, carpets, porcelain, and carbonated water, and beer is brewed. Besançon is the birthplace of the French novelist Victor Hugo. Pop. (1946) 63,507.

BESANT, Annie (1847–1933), British theosophist and nationalist leader in India, born in London, and privately educated. She early became interested in socialistic and freethinking movements, and, writing pamphlets under the name Ajax, was associated with the English social reformer Charles Bradlaugh and the Fabians (see Fabian Society). With Bradlaugh she wrote *The Fruits of Philosophy*, publication of which led to the arrest of both authors for alleged immorality. In 1889 she joined the Theosophical Society (q.v.), serving as its president from 1907 until her death. Shortly after joining the society she went to India, where she later became a leader of a Hindu nationalist movement. She founded Central Hindu College at Benares (1898) and organized the Indian Home Rule League, becoming its president (1916). She was president of the Indian National Congress (1917), and general secretary of the National Convention of India (1923). She lectured at frequent intervals on theosophy (q.v.), in 1926 traveling widely with her Indian protégé Krishnamurti, whom she declared to be the new Messiah. Her later works include *The Basis of Morality* (1915), *A World Re-*

ligion (1916), *India, Bond or Free?* (1926), and *World Problems of Today* (1926).

BESNARD, Paul Albert (1849–1934), French painter, born in Paris, and trained privately and at the École des Beaux Arts, Paris. After winning the Prix de Rome in 1874 he went to Italy for further study. He painted portraits, landscapes, and murals, and worked in oils, water colors, and pastels. He was also an engraver and an etcher. At first a follower of academic traditions in painting, Besnard later came under the influence of impressionism (q.v.) as well. In 1911 he made a trip to India and on his return exhibited a number of brilliantly colored sketches he had made there; these won great acclaim. In 1914 he was commissioned to do a number of frescoes for the Peace Palace at The Hague, in the Netherlands. Among his other murals are those at the Sorbonne, the Hôtel de Ville, and the Comédie-Française, all in Paris. His canvases include "Femme Qui Se Chauffe" in the Luxembourg Museum in Paris, and "Portrait de Femme" in the Düsseldorf Museum, Germany.

BESSARABIA, region between the Prut and Dniester rivers in the U.S.S.R. It is roughly wedge-shaped, with its base on the Black Sea and extending northwesterly about 300 miles. The land is flat and fertile, except for the N.W. corner, which is hilly and well forested, and the coastal strip, where sand and salt marshes predominate. The principal occupations are farming and the raising of horses, cattle, and other farm animals. Among agricultural products are grains, fruits, tobacco, and flax; leather goods, soap, and candles are manufactured.

Bessarabia has been fought over for thousands of years. In ancient times it was occupied by many peoples, including the Romans, who made it part of the province of Dacia, and the Bessi, a Thracian tribe who held it in the 7th century and gave it their name. Conquered and annexed by the prince of Moldavia in 1367, the territory was ruled alternately by the Crimean Tatars and the Ottoman Turks throughout the 16th century, and from 1700 to 1812 by the Russians and the Ottoman Turks. In 1812, by the terms of the Treaty of Bucharest, it became part of the Russian Empire, in which it remained, with minor exchanges of territory, until it declared its independence during the Russian revolution of 1917. Romania annexed Bessarabia in 1918, forming it into a province. The Soviet Union refused to recognize Romanian control, and in June, 1940, soon after the outbreak of World War II, forced Romania to return the region. The S.E. part along the Black Sea coast and a small portion in the northwest were then added to the Ukrainian S.S.R., and the remainder, together with a part of the Ukraine, was constituted as the Moldavian S.S.R. Romanian and German troops occupied Bessarabia in June, 1941, when the Axis powers attacked the Soviet Union, and held the region for three years. After the conclusion of an armistice between the U.S.S.R. and Romania in 1944, the territory was returned to the Soviet Union. Area, about 18,000 sq.m.

BESSARION, Johannes or Basilius (about 1395–1472), Greek scholar and Roman Catholic churchman, born in Trebizond, and educated in Constantinople. He became archbishop of Nicæa in 1437 and went to Italy with Eastern Roman Emperor John VII Palæologus in an unsuccessful effort to unite the Latin and Greek churches. Pope Eugenius IV made him a cardinal in 1439; Bessarion remained in Italy thereafter, becoming a patron of scholars and a collector of books and manuscripts. He was appointed Latin patriarch of Constantinople in 1463. Bessarion is the author of *In Calumniatorem Platonis*, a work which attempted to reconcile the ideas of the ancient Greek philosophers Aristotle and Plato. His extensive collection of Greek manuscripts, given by him to the senate of Venice, became the nucleus of the library of St. Mark, in Venice.

BESSEL, Friedrich Wilhelm (1784–1846), German astronomer, born in Minden, Prussia. He supervised the construction of the Königsberg observatory and, on its completion in 1813, became its director, serving until his death. He developed a theory of instrumental errors and applied it to the observations of 3222 stars made by the English astronomer James Bradley. Bessel published his findings in his *Fundamenta Astronomiae* (1818). In *Tabulae Regiomontanae* (1830) he established the uniform system of reduction (the computation of star positions) which is still in use. From 1821 to 1833 he made accurate determinations of the positions of stars to the ninth magnitude, bringing the number of stars so catalogued to 50,000. His *Astronomische Unterschungen* was published in 1842. Bessel was the first to succeed in determining the annual parallax of a fixed star, 61 Cygni (see Stars), thus giving final confirmation to the heliocentric theory. He also determined the diameter, weight, and ellipticity of the earth. In the investigation of

problems connected with planetary perturbation, he introduced into mathematics the *Bessel functions* as the solutions of certain differential equations. The functions express the solution in the form of infinite series, and are of great importance in determining the distribution and flow of heat or electricity through a circular cylinder, and in the solution of problems concerning wave theory, elasticity, and hydrodynamics.

BESSEMER, city of Jefferson Co., Ala., about 10 miles S.W. of Birmingham. It is a manufacturing center, with coal, iron ore, limestone, graphite, and a wide variety of other mineral deposits in the surrounding area, and with excellent transportation facilities. Among the products manufactured in Bessemer are pig iron, steel, freight cars, cast-iron pipe, fertilizers, explosives, chemicals, brick, and cement. The city was laid out in 1886 and named after the English inventor Sir Henry Bessemer; it was incorporated in 1887. Pop. (1950) 28,445.

BESSEMER, Sir Henry (1813–98), English inventor, born in Charlton, Hertfordshire, and largely self-educated. He was a prolific inventor, but is best known for his process (see Iron, Metallurgy of) for the manufacture of steel. This process raised the annual production of steel in England enormously by making an excellent grade of steel available at a fraction of the former cost. Royalties from the licensing of the patents brought Bessemer over £1,000,000. He received many honors, including knighthood and a fellowship in the Royal Society, both awarded in 1879.

BESSEMER PROCESS. See Iron, Metallurgy of.

BESSENYEI, György (1747–1811), Hungarian dramatist and poet, born in Berczel, Szabolcs. In 1765 he was chosen, with other young nobles, to form Empress Maria Theresa's Hungarian bodyguard at Vienna. He soon formed within the royal bodyguard a literary circle which was rooted in French classicism and bore the seeds of the modern Hungarian Renaissance. Bessenyi's earliest work was a tragedy dealing with Spartan history, *Agis* (1872), and was followed by other tragedies based upon Magyar traditions. His later works include comedies modeled on those of the French dramatists, one of which, *The Philosopher* (1777), was the first true comedy written in the Hungarian language; an epic, *King Matthias*; and a series of prose works in the field of history and philosophy.

BEST, Charles Herbert (1899–), Canadian physiologist, born in West Pembroke, Maine, of Canadian parents, and educated at the University of Toronto, Ontario, Canada. In 1921, while a medical student, he worked in partnership with the Canadian research physician Frederick Grant Banting, and performed with him the research on insulin which led to the award of the Nobel Prize, in 1923, to Banting and to the Scottish physiologist John James Rickard Macleod, who was director of the physiological laboratory. Banting shared his part of the prize equally with Best. In 1923 the Banting-Best Department of Medical Research was formed at the University of Toronto; Best became research associate of the department and, after Banting's death in 1941, its director. In 1929 he became a full professor at the University of Toronto and director of the department of physiology. During World War II he was a member of several committees for military medical research, and was influential in organizing the Canadian program for procurement and use of dried human blood serum. From 1941 to 1946 Best served in the Royal Canadian Navy. He was director of the R.C.N. Medical Research Division and held the rank of surgeon captain.

BETA RAYS. See Radioactivity.

BETATRON, apparatus designed to accelerate electrons (q.v.) to high energies by means of magnetic induction. The machine was developed by the American physicist Donald William Kerst (1911–) in 1940. In the betatron an electron gun injects a stream of electrons into an evacuated, doughnut-shaped chamber located between the poles of an electromagnet. By applying an alternating current to the electromagnet, the electromotive force induced by the changing magnetic flux through the circular orbit accelerates the electrons to high energies. The particles are then directed at an internal metal target to produce X rays of equivalent energy (see X Ray), or are released from the betatron as a beam of high-speed projectiles for use in nuclear research.

Besides being valuable in the study of nuclear structure, the betatron has important applications in industrial and medical research. X rays produced by the betatron are very penetrating and hence are useful in the testing of metals. The X rays are also applied experimentally in medical therapy, notably for the treatment of cancer. According to medical reports in 1954, such X rays may be used as a substitute for the surgeon's knife in several

operative procedures, particularly those involving the brain. See CYCLOTRON.

BETEL, common name for a vine, *Piper betle,* in the Pepper family, and for its leaves. In India and the Malay Archipelago the leaves, together with a little quicklime, are used to wrap the areca (q.v.) nut (also called betel nut) to form an aromatic and astringent masticatory. The chewing of this preparation colors the teeth black and the saliva blood red; it is said to act as a tonic and to increase the powers of endurance. About one third of the inhabitants of tropical Asia and the East Indies habitually chew the preparation.

BETELGEUSE, BETELGUESE, or **BETELGEUX,** reddish star of the first magnitude, in the constellation Orion, on the celestial equator. It is an irregularly variable star, with a diameter varying from 180 to 260 million miles. The diameter was measured at Mount Wilson Observatory in 1920 by the American astronomer Francis G. Pease, with the use of an interferometer (q.v.). Betelgeuse was the first star to be measured by this method.

BETHANY (Ar. *el-Azarīyeh*), small farming village of Arab Palestine, on the Mount of Olives, 2 miles E.S.E. of Jerusalem. It is referred to in the Bible as the home of Lazarus (John 11 and 12) and of his sisters Martha and Mary, and as a place often visited by Jesus.

BETHEL (Heb., "the house of God"), ancient village of Arab Palestine, 10 miles N. of Jerusalem. It is called *Beitīn* by the Arab inhabitants, and is mentioned in the Bible as Luz (Gen. 28:19). There, according to the Scriptures, Abraham pitched his tent and made an altar (Gen. 12:8) and Jacob had his vision of the ladder and angels (Gen. 28:12). Bethel was also a resting place of the ark of the covenant, and later a royal residence and a seat of idolatrous worship. The village contains remains of churches dating from the 6th and 12th centuries.

BETHESDA (Heb., "the house of mercy"), a pool or public bath in Jerusalem at the time of Christ. It is now generally believed to have been located between the Temple and the Via Dolorosa. In the Bible it is mentioned as the scene of Christ's cure of the impotent man (John 5:2-9), and of other miraculous cures.

BETHLEHEM. See BEDLAM.

BETHLEHEM, city of Northampton and Lehigh counties, Pa., on the Lehigh R., about 53 miles N. of Philadelphia. It was founded on Christmas Eve, 1741, by a party of Moravians from Bohemia and Saxony, under the leadership of David Zeisberger. The first group was soon joined by another, under Count Nicholas von Zinzendorf, bishop of the Moravian Church. The Moravian element is still dominant in the social structure of the city. Bethlehem is known as America's "Christmas City", and features in its historic observance of the Yuletide a 100-foot electric star atop South Mountain, just outside the city. The famous Bach Festival, a development of the Moravian "service of song", is held annually in May.

Industrially, Bethlehem and the immediate environs rank third (after Philadelphia and Pittsburgh) in the State. The city is one of the country's most important centers of steel production and is the center of the world's largest cement-producing area. Among other products manufactured in the city are foundry and machine products, electrical equipment, oil burners, silk and textile products, hosiery, furniture, plumbing fixtures, pumps, spark plugs, heating appliances, iron fences, shoes, mattresses, cigars, tar products, and various food products. Bethlehem is the site of Lehigh University, the Moravian College for Women, and the Moravian College and Theological Seminary. Pop. (1950) 66,340.

BETHLEHEM (Heb., "the house of bread" or "of deity"; Ar. *Beitlahm*), town of Palestine (q.v.), Jordan, situated 5 miles S. of the city of Jerusalem, in an agricultural district noted for its vineyards and wine. Ancient Bethlehem, in the time of Saul, first king of Israel, was occupied by the Philistines. It was the early home of Saul's successor King David, and the Bethlehem district was in the Bible the *Ephrathah* of the history of Jacob and the scene of the story of Ruth. The town is most famed, however, as the birthplace of Jesus. In 330 the Roman emperor Constantine erected a basilica in the area traditionally regarded as the site of the Nativity. The Church of the Nativity, as this structure (later enlarged) is known, is one of the oldest extant examples of Christian architecture. It is shared by the Roman Catholic, Orthodox, and Armenian churches for devotional purposes. The site appears to have been venerated since the 2nd century A.D.; St. Jerome found the grotto in possession of pagans, who celebrated there the birth of Adonis. To the northwest stands a square, domed building, marking the reputed site of Rachel's tomb. During World War I, Bethlehem was captured from the Turks by Allied troops on December 8, 1917. It was included in the British mandate of Palestine from 1922 to 1948, when the state of Israel

James A. Fitzpatrick

Building near Bethlehem, Jordan, marking the reputed site of Rachel's tomb

(q.v.) was created. Bethlehem formed part of the section of Palestine occupied by Jordan (q.v.) and was officially incorporated into Jordan in 1950. Pop. (1946 est.) 9140.

BETHLEHEMITES or **BETHLEHEMITE BROTHERS. 1.** An order of monks mentioned by the English historian Matthew Paris as being at Cambridge, England, in 1257. They wore on the front of their habit a red star with five points and a blue disk, in allusion to the Star of Bethlehem, but otherwise dressed as Dominicans. **2.** An order founded in Guatemala by a Franciscan friar named Pedro de Betancourt (1619–67). It developed from a congregation living under the rule of the Third Order of St. Francis, and was devoted especially to the care of the sick and the education of children. Its constitution was approved by Pope Clement X in 1672, and the congregation was expanded into an order in 1687 and put under the rule of the Augustinians. Its members dressed similarly to the Capuchins and carried on their right breast a shield with a representation of the manger at Bethlehem and near it figures of Mary and Joseph. They were specially bound to exercise hospitality and to tend the sick. In 1668 a female order of the name was founded in Guatemala. The orders spread in South America, but in 1820 were secularized and by 1845 were extinct. **3.** The followers of the Bohemian religious reformer John Huss (q.v.), styled Bethlehemites from the Bethlehem Church in Prague, at which their leader preached.

BETHLEN or **BETHLEN VON IKTÁR,** Gabriel or Gábor (1580–1629), Prince of Transylvania (1613–29) and King of Hungary (1620–29), born in Illyé. He was a member of a prominent Protestant family of upper Hungary and was noted for his military activities in behalf of the Protestant cause in the Thirty Years' War. In 1619 he led a Protestant Hungarian army against the forces of the Catholic Ferdinand II, Holy Roman Emperor. Bethlen's success in penetrating to the gates of Vienna in this war led to his election as king of Hungary. In 1623 and 1626 he again took part in the Thirty Years' War. After 1626 he devoted himself exclusively to the internal affairs of Transylvania, which he made a center of Hungarian patriotism and culture.

BETHLEN, Count Stephen (1874–1950), Hungarian political leader, born in Gernyeszeg, Transylvania, and educated at the University

of Budapest. He entered the Hungarian parliament as a Liberal in 1901; in 1905, while remaining a member of the parliament, he transferred his allegiance to the Independent Party. In 1919 he led the counterrevolutionary movement against the communist regime set up by the Hungarian communist leader Béla Kun, and in 1921 he became prime minister. His government passed a series of reform bills, and he was able to obtain the aid of the League of Nations in the financial reconstruction of the country, which gradually emerged from chaos. Bethlen was prime minister until 1931, and leader of his party until 1935. He retired from politics in 1939.

BETHMANN-HOLLWEG, THEOBALD VON (1856–1921), German statesman, born in Hohenfinow, Brandenburg, and educated at the universities of Strasbourg, Leipzig, and Berlin. In 1905 he became Prussian minister of the interior and in 1907 imperial secretary of state for the interior; in 1909 he succeeded Prince Bernhard von Bülow as chancellor of the German Empire. At the beginning of World War I, he referred to the treaty by which five great European powers had (1839) guaranteed the neutrality of Belgium as a "scrap of paper"; this characterization became historic (see WORLD WAR I). He refused to accede to the policy of unlimited submarine warfare adopted by Germany in 1917 and was forced to resign the chancellorship. He is the author of *Reflections on the World War* (1919).

BETHNAL GREEN, metropolitan borough of London, England, situated in the East End of the city. It is an industrial district, with plants engaged in the manufacture of boots, furniture, and match boxes. Within the borough is the Bethnal Green Museum, opened in 1872, and now a branch of the Victoria and Albert Museum in South Kensington. Pop. (1951 prelim.) 58,374.

BETH-PEOR (Heb., "house of Peor", i.e., of the god Baal-Peor), Biblical town in which Israel is said to have received the Deuteronomic laws (Deut. 3:29), and in the locality in which Moses is supposed to have been buried. The site of the town cannot be identified, but may have been about 10 miles S.E. of the mouth of the Jordan R. in the Dead Sea, in present-day Jordan.

BETHSAIDA OF GALILEE or **OF GAULONITIS,** also called BETHSAIDA JULIAS, Biblical town, now in ruins, situated on the N.E. shore of the Sea of Galilee, near the mouth of the Jordan R. To distinguish this town from a newer Greek town, also called Bethsaida, situated farther back from the shore, the Apostle John refers to the former as "Bethsaida of Galilee" (John 12:21). Near Bethsaida of Galilee, the home of three of His disciples, Jesus fed the 5000; it was this place that He denounced for its unreceptivity to His ministry; and it was outside its walls that He took the blind man to heal him of his infirmity.

BETHUNE, MARY MCLEOD (1875–1955), American Negro educator, born in Mayesville, S.C., and educated at Barber-Scotia College, Concord, N.C., and Moody Bible Institute, Chicago, Ill. She was a teacher in Georgia and Florida schools from 1897 to 1903. In 1904 she founded the Daytona (Fla.) Normal and Industrial School for Girls, now Bethune-Cookman College, and served as its president from 1904 until 1943, when she became president emeritus. She was director of Negro affairs in the National Youth Administration from 1936 to 1942, and during World War II served as special assistant to the U.S. secretary of war in selecting the first officer candidates for the Women's Auxiliary Corps. As founder and president of the National Council of Negro Women, and vice-president of the Na-

Sculpture of Christ healing the blind man outside the walls of Bethsaida

tional Association for the Advancement of Colored People and of the National Urban League, she contributed greatly to the promotion of Negro welfare and education, and to interracial understanding.

BETOYAN, an important South American Indian linguistic stock, occupying parts of eastern and southern Colombia and the adjacent regions of Venezuela and Brazil. The principal tribes are the Kobéuas, Túkanos, Kuretús, Yupúas, Betóyas, Correguages, Piojés, and Tamas. Many are quite primitive, but some have taken up agriculture, with manioc and corn as staple crops. The more advanced tribes make pottery, but weaving is unknown, and clothing is made of bark and tree bast. The most common weapons of the Betoyan tribes are blowguns, bows, and arrows, spears, and clubs; their blowgun darts, arrows, and spears are frequently poisoned. Their religious customs vary, but most tribes practice elaborate puberty and funeral ceremonies.

BETTERTON, Thomas (1635?–1710), English actor, born in Westminster. In 1661 he became a member of the theatrical company at the Lincoln's Inn Fields Theatre, and soon won great popularity. The best contemporary English writers, such as Joseph Addison, Richard Steele, Samuel Pepys, and Alexander Pope, highly praised his impersonations. Betterton is best known for his portrayal of the role of Hamlet in William Shakespeare's play of the same name.

BETULACEAE, family of trees and shrubs, the Birch family, in the order Fagales. Widely distributed in the temperate regions of the Northern Hemisphere, they are hardy, deciduous, monoecious plants. The family is divided into two tribes, the Betuleae, containing the birch and alder, and the Coryleae, containing the hazelnut and hornbeam. See separate articles under the above common names.

BEUTHEN. See Bytom.

BEVATRON. See Cyclotron.

BEVELAND, NORTH and **SOUTH,** two islands in the estuary of the Schelde R. in the province of Zeeland, the Netherlands. North Beveland is low and marshy. South Beveland is the largest and most fertile of the Zeeland islands. Fruit growing and oyster breeding are important industries on both islands. Goes (pop. in 1947, 12,762), on South Beveland, is the chief town. Area of North Beveland, 35 sq.m.; pop., about 8000. Area of South Beveland, 144 sq.m.; pop., about 51,000.

BEVERIDGE, Albert Jeremiah (1862–1927), American political leader and author, born in Highland County, Ohio, and educated at DePauw University, Indiana. From 1899 to 1911 he was United States senator (Republican) from Indiana. In 1912 he became one of the leaders of the Progressive Party (q.v.), and was its nominee for the U.S. Senate in 1912 and for governor of Indiana in 1914, but was defeated in both elections. In 1922 he returned to the Republican Party and was its candidate for U.S. senator from Indiana, but was defeated by the Democratic nominee. Beveridge was a notable orator and writer. Among his works are *Life of John Marshall* (4 vols., 1916–19), *The State and Nation* (1924), and *Abraham Lincoln 1809–1858* (2 vols., 1928).

BEVERIDGE, William Henry Beveridge, 1st Baron (1879–), English economist, born in Rangpur, India, and educated at Oxford University. His career was marked by an unflagging interest in social problems. He was director of labor exchanges for the city of London from 1908 to 1912 and, as a member of the Food Ministry during World War I, instituted a plan for wartime rationing. From 1919 to 1937 he was director of the London School of Economics, and from 1937 to 1944 was master of University College, Oxford. Beveridge is particularly noted for his report *Social Insurance and Allied Services* (1942), which he prepared as chairman of the governmental Inter-Departmental Committee on Social Insurance and Allied Services, and in which he worked out a system of social security "from the cradle to the grave" for the entire British people. This report became known as the Beveridge Plan. It was supplemented in 1944 by a report *Full Employment in a Free Society*, in which he proposed measures to secure permanent full employment in Great Britain. He was elected a Liberal member of the House of Commons in 1944 and in November of that year the House indorsed a government motion for an extensive social-insurance plan—the Beveridge Plan in a modified form. In July, 1946, Parliament passed the National Insurance (Industrial Injuries) Act, and in August, 1946, the National Insurance Act, both based on the Beveridge Plan. In September, 1946, the National Health Service Act, based partly on his plan, was enacted. Beveridge was knighted in 1919 and created baron in 1946. In addition to the works mentioned, he wrote *Insurance for All* (1924), *Causes and Cures of Unemployment* (1931), *Planning under Socialism* (1936), *The Evidence for Voluntary Action* (1949), and *Power and Influence* (autobiography, 1955).

BEVERLY, city of Essex Co., Mass., 18 miles N.E. of Boston. It is situated on a narrow inlet of Massachusetts Bay, opposite Salem. Transportation facilities include railway and motor-bus services. The city is a shoe-machinery manufacturing center. Other industries include horticulture and the manufacture of shoes, linotype parts, sails, mattresses, and organs. Important waterborne cargoes received at Beverly for transshipment are petroleum and coal. The city is also a popular summer resort, with 9 m. of shore line and several excellent public beaches. Among points of historic interest in Beverly are the site of the first cotton mill in America, established in 1788; Glover's Wharf, at which the first ship of the U.S. Navy was fitted out; and a number of 17th-century edifices. Beverly was founded in 1626 by the English colonist Roger Conant, and formed part of Salem until 1668, when it was incorporated as a town under its present name. Beverly was chartered as a city in 1894. Pop. (1950) 28,884.

BEVERLY HILLS, city of Los Angeles Co., Calif., surrounded by the city of Los Angeles. It is chiefly residential and is famed as the home of celebrities of the motion-picture industry. Pop. (1950) 29,032.

BEVIN, ERNEST (1881–1951), British labor leader and statesman, born in Winsford, Somersetshire, and educated at Colebrook School, Devon. About 1909, after working at a number of manual trades, he became a labor organizer, and in 1920 he gained a nationwide reputation when his eleven-hour speech before the Transport Workers' Court of Inquiry resulted in a standard minimum wage for English dockworkers. Bevin organized the Transport and General Workers' Union, a national merger of thirty-two British unions, in 1922, and became its general secretary; in 1936–37 he served as chairman of the General Council of the British Trades Union Congress. While rising to prominence as a labor leader, he also became one of the most important figures in the British socialist movement and in the Labor Party. In 1940, during World War II, he entered the coalition cabinet of Prime Minister Winston Churchill as minister of labor and national service, and in 1945, at the conclusion of the war, he became foreign minister in the Labor cabinet formed by Prime Minister Clement Attlee.

As foreign minister, Bevin was a member of the Council of Foreign Ministers of the great powers which prepared peace treaties with the European allies of Germany in World War II. In the immediate postwar period he figured prominently as the official spokesman of British opposition to the formation of a Jewish national state in Palestine. Subsequently, Bevin became one of the leaders in the struggle against the spread of communism throughout the world. In 1950 he pledged his country's support to the United Nations forces raised to suppress communist aggression in Korea. In March, 1951, shortly before his death, Bevin resigned as foreign minister because of ill-health, and for the remainder of his life he served in the less arduous post of lord privy seal.

BEWICK, THOMAS (1753–1828), English wood engraver, born in Cherryburn, Northumberland. He became apprentice to, and later partner of, an engraver at Newcastle. He illustrated a *History of Quadrupeds* (1790) with humorous vignettes and ornamental designs, as well as excellent representations of animals, and its popularity led to the publication of a similar *History of British Birds* (1797 and 1804), also illustrated by Bewick. Among his numerous other works is an illustrated version of *Æsop's Fables* (1818). Bewick is known as the reviver of the art of wood engraving which flourished during the German Renaissance. He was the first to use the "white line" in wood engraving. His son, ROBERT ELLIOTT BEWICK (1788–1849), became his partner in 1812, and helped to prepare cuts for an unfinished *History of British Fishes* (posthumously published, 1862).

BEXLEY, urban district of Kent, England, 14 miles S.E. of London. Farming, metal machining, and the manufacture of chemicals are the chief occupations. Pop. (1951 prelim.) 88,767.

BEYEREN, ABRAHAM VAN (1620?–75?), Dutch painter, born in The Hague. He was one of the outstanding genre painters of his time, and he won particular distinction with his still-life compositions, notably those of fish. His studies of the latter are remarkable both in arrangement and in the use of color. Many of his paintings are in the collections of European galleries.

BEYLE, MARIE HENRI. See STENDHAL.

BEYROUTH. See BEIRUT.

BÈZE, THÉODORE DE, or THEODORUS BEZA (1519–1605), French theologian and Protestant reformer, born in Vézelay, Burgundy. In 1559 he went to Geneva, where he became coadjutor to the French religious reformer John Calvin, and was appointed professor of theology at the Geneva Academy. In 1581 he presented to Cambridge University the famous

New Testament manuscript known as *codex D,* or *codex Bezæ,* which he claimed to have obtained from a monastery in Lyon. After the death of Calvin he presided over the synods of French reformers held at La Rochelle in 1571, and at Nîmes in 1572. His works include a Latin translation of the New Testament and *Histoire Ecclésiastique des Églises Réformées de France, 1521–1563* (3 vols., 1580).

BÉZIERS (anc. *Bœtteræ*), town of the department of Hérault, France, situated at the junction of the Orb R. and the Canal du Midi, about 47 m. by rail S.W. of Montpellier. It is a trading and industrial center, with plants engaged in the manufacture of silk stockings, woolens, gloves, parchment, glass, soap, leather, confectioneries, and brandy. Béziers is noted for its Gothic Cathedral of St. Nazaire, and for an ancient episcopal palace, now used for government offices. The old citadel has been destroyed, but the walls still remain. In 1209 the inhabitants were massacred by troops under the Anglo-Norman soldier and crusader Simon IV de Montfort l'Amaury for protecting Albigensian fugitives (see ALBIGENSES). Pop. (1946) 64,561.

BEZIQUE, game of cards, played by two, three, or four persons, with a double deck from which all cards from deuce to six have been discarded. The object of the game is to take tricks containing scoring cards (ace, ten, king, and queen), and to form and declare, or meld, certain scoring combinations of cards. These combinations and their values are the same as in pinochle (q.v.), except that the seven, instead of the nine, of trumps is the *dix.* Eight cards are dealt to each player, and the balance of the pack is turned face down on the table to form the *stock.* Trump may be determined by turning the top card of the stock, or by the suit of the first king-queen combination declared. The player to the left of the dealer leads a card to the first trick, and he wins the trick unless an opponent plays a higher card of the suit or a trump. The winner of the trick may then declare any one combination in his hand, whereupon each player draws a card from the stock, and the winner leads to the next trick. No other restrictions on play are imposed until the stock is exhausted; thereafter the players must follow suit—or trump, if void of the suit led—and take the trick if possible. Game is won by the first player reaching 1000 points, and counts as two games if no opponent has attained a score of 500.

BEZWADA, officially VIJAYAVADA, city of Kistna District, Madras State, Union of India, situated on the Kistna R., about 45 miles N.W. of Masulipatam. It is an important railway junction and the administrative center of the Kistna irrigation system. Rice milling and cotton processing are the principal industries. Famous rock-hewn Buddhist temples are located nearby. Pop. (1951) 161,198.

BHADGAON, town of Nepal, 8 miles E. of the capital, Katmandu, and about 75 miles from the border of the Union of India. It is noted as a Hindu religious center, and has Sanskrit libraries. Pop. (1920) 93,176.

BHAGALPUR (Hind. *bhagal,* "tiger"; Skr. *pur,* "city"), capital of a district of the same name, Bihar State, Union of India. The town is on the Ganges R., 265 m. by rail N.W. of Calcutta. It is an important railway and commercial center; its chief industry is the manufacture of coarse silk goods. Bihar University was established there in 1952. Bhagalpur District lies south of Nepal. About a fifth of its area is covered with hills, spurs of the Vindhya Mts. to the southwest. The district, watered by the Ganges, Kosi, and Ghagri rivers, is almost entirely under cultivation. Cereals, especially rice, legumes, tobacco, cotton, indigo, opium, flax, hemp, and sugar cane are the principal products. A large trade is carried on with lower Bengal by river and by rail. Area of Bhagalpur District, 4248 sq.m.; pop. (1951) 1,429,069. Pop. of city (1951) 114,530.

BHAGAVAD-GITA (Skr., "the Song of the Blessed One"), Sanskrit theosophical poem of about seven hundred double verses, forming an episode in the religious epic *Mahabharata* (q.v.). It consists of a colloquy between the divine Krishna, an incarnation of the god Vishnu, and the hero Arjuna, and is a discourse on life, duty, and devotion to the Supreme Spirit. This passage has long been regarded by the Hindus as a sacred textbook, and it has been translated into most modern Indian vernaculars.

BHAGAVATA PURANA, most celebrated of the puranic scriptures of Hinduism (see PURANA), dedicated to the glorification of the deity Vishnu. All the legends about Krishna (q.v.) are given in detail in the tenth book.

BHAMO, capital of a district of the same name, Kachin State, Upper Burma. The town is the head of navigation of the Irrawaddy R., 300 m. from Mandalay and 900 m. from the sea. It was formerly the capital of a Shan principality. Situated 40 m. from the Chinese frontier, it was the chief

center of Burmese trade with China until the opening of the Burma Road (q.v.). The inhabitants of the district are mainly Burmese, Shan, and Chinese. Area of district, 4146 sq.m.; pop. (1941) 129,302. Pop. of town (1931) 7827.

BHARATPUR or **BHURTPORE,** city of Rajasthan Union, Union of India, situated about 35 miles W. of Agra. Prior to April, 1949, it was the capital of a princely state of the same name. The princely state of Bharatpur merged at that time with several neighboring princely states into Rajasthan Union. Among the points of interest in the city are its ramparts, constructed of dried mud, and an imposing palace. The city is noted for its handicrafts, especially the manufacture of ivory, silver, and sandalwood chowries. Area of former state, 1978 sq.m.; pop. (1941) 575,625. Pop. of city (1941) 35,541.

BHATPARA, city of West Bengal, Union of India, on the E. bank of the Hooghly R., about 20 miles N. of Calcutta. The city has numerous jute mills. Pop. (1951) 134,916.

BHAVABHUTI (fl. about 700), Sanskrit dramatist of south-central India. He is widely known for three dramas, all of which have been translated into English; they are *Malātī-mādhava* (a romantic play in ten acts), *Mahāvīra-charita,* and *Uttara-rāmacharita.* See SANSKRIT.

BHAVNAGAR or **BHAUNAGAR,** city of Saurashtra Union, Union of India, situated on the W. coast of the Gulf of Cambay, about 60 miles N.W. of Surat. Prior to February, 1948, the city was capital of a princely state of the same name. The state, a member of the Western States Agency until the termination of British control in India, merged at the time cited above with the other members of the agency to form the Saurashtra Union. The city is an important port, with an extensive trade in iron and cotton. Iron making and the manufacture of cotton textiles and tile are its leading industries. Area of former state, 2961 sq.m.; pop. (1941) 618,429. Pop. of city (1951) 137,951.

BHAWALPUR. See BAHAWALPUR.

BHIL, or BHEEL, a primitive tribe, probably pre-Aryan, of central India, inhabiting the region from the Khandesh district of Bombay to the hilly tracts of the Vindhya range, north of the Nerbudda River. Their language belongs to the Kolarian branch of Indian tongues, but many speak a corrupt form of the Aryan Gujarati. They are short, dark-skinned, and have some traces of Aryan and perhaps also of Dravidian blood. The Bhils of the hill country, in particular, are noted for their belief in witchcraft and magic. The indigenous Bhil economy is of the most primitive kind; those members of the tribe still living in the hills wear little clothing and subsist on such foods as insects and wild grains, roots, and fruits. During British paramountcy in India some Bhils became farmers and others were recruited as soldiers and policemen. The tribe now numbers about 1,250,000.

BHOPAL, Centrally Administered Area of the Union of India, formerly a princely state, situated in the central part of the country. It is traversed by the Vindhya Mountains and contains large tracts of jungle. Farming is the chief occupation; crops include sugar cane, ginger, cereals, cotton, and tobacco. The capital is Bhopal (q.v.), former capital of the princely state. Founded in 1723 by an Afghan chieftain who had fought in the armies of Aurangzeb, the Mogul emperor of Hindustan, Bhopal became a British protectorate under the provisions of a treaty concluded in 1817. It was subsequently made a member of Bhopal Agency, a subdivision of Central India Agency. Female members of the royal family ruled the state from 1844 to 1926, when the reigning begum abdicated in favor of her son. Though Moslems comprise a large majority of the population, Bhopal adhered to the Dominion (later Union) of India following the partition (1947) of British India into Hindu and Moslem nations. It was constituted a Centrally Administered Area on June 1, 1949. Area, 6921 sq.m.; pop. (1951) 838,107.

BHOPAL, capital of the Centrally Administered Area of the same name, Union of India, situated about 180 miles N.W. of Nagpur. Points of interest include a rampart (2 m. in circumference), which encircles the city, and two mosques. Prior to the termination (1947) of British paramountcy in India the city was capital of the princely state of Bhopal (q.v.). Pop. (1941) 75,228.

BHURTPORE. See BHARATPUR.

BHUTAN, semi-independent state in the eastern Himalaya, bounded on the N., E., and N.W. by Tibet, and on the S. and S.W. by Assam and Sikkim. The entire state is mountainous, sloping gradually from north to south, with summits exceeding 24,000 ft. Wild animals found in Bhutan include the elephant, leopard, deer, wild hog, bear, and rhinoceros.

The inhabitants are Mongolians, and their religion is Buddhism of the Tibetan form. The original inhabitants, the Tephus, were subju-

gated two centuries ago by a band of military colonists from Tibet. By a treaty concluded in 1910, the British government agreed not to interfere in the internal administration of Bhutan, and the Bhutanese government agreed to be guided by the advice of the British government on its external affairs.

Bhutan formerly included considerable tracts of territory, now included in Bengal and Assam, which were annexed in 1841 by the British government. After the annexation the Bhutias were hostile to the British and frequently raided British frontier posts. The British confronted the Bhutan government with a demand for reparations in 1863. The demands were rejected. In 1865, after the Bhutias had rejected another ultimatum, a punitive expedition was sent against them. A treaty concluded with the Bhutan government provided for the payment by the Indian government of an annual subsidy in return for formal cession of the annexed territory. This subsidy, which was payable on condition that Bhutan maintain peaceful relations with its neighbors, was increased from 50,000 rupees in 1865 to 100,000 in 1910 and 200,000 in 1942. By the terms of a treaty concluded in August, 1949, by Bhutan and the Union of India, the subsidy was increased to 500,000 rupees. The treaty also provided for the return to Bhutan of about 32 sq.m. of the territory ceded to the British in 1865.

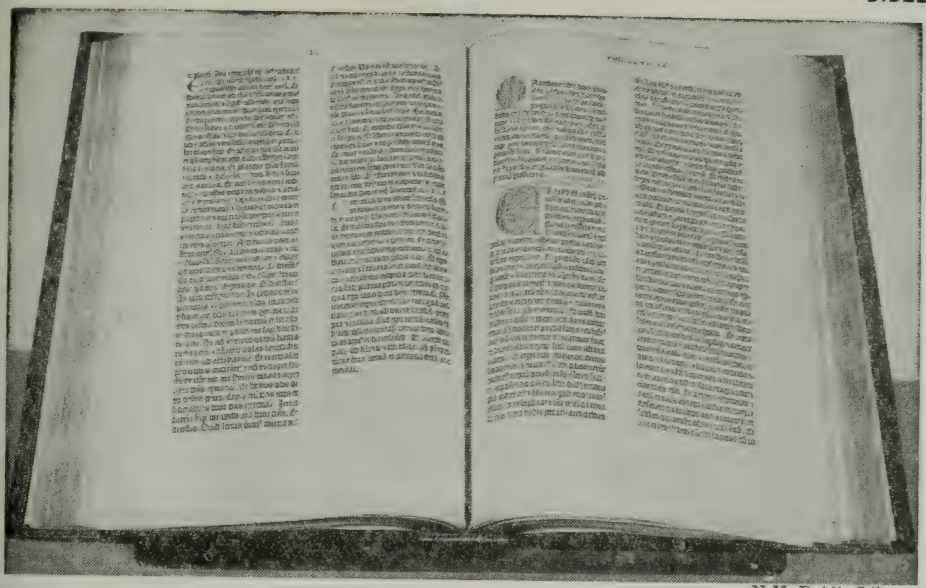
Some portions of Bhutan are fertile, and produce corn, rice, wheat, buckwheat, mustard, and cardamoms. Cattle and considerable numbers of a peculiar breed of ponies are raised. The manufactures, which are primitive and intended for home consumption, include blankets and cotton cloth, swords and other weapons, and agricultural implements.

The winter capital of the state is Punakha (pop., about 5000), a strong, natural fortress 96 miles E.N.E. of Darjeeling; Tashi Cho Dzong is the summer capital. In 1907 Sir Ugyen Wang-chuk was elected first hereditary maharajah. His grandson Jigme Dorji Wangchuk was installed as maharajah in 1952. Area, about 18,000 sq.m.; pop. (1955 est.) 623,000.

BIALIK or **BYALIK,** CHAIM NACHMAN (1873–1934), Hebrew poet, born in Radi, in the province of Volhynia, Russian Ukraine, and educated at the Yeshibah (Rabbinical school) of Volozhin. Later, when a resident of Odessa, he contributed poems to the Hebrew magazine *Hashiloach*. In 1903 his poem *In the City of Slaughter*, dealing with the pogrom of the Jews at Kishinev in that year, made him famous and widely encouraged the growth of Zionist sentiment among the Jewish people. He was one of the founders of an Odessa firm publishing Hebrew literature. He moved that business to Berlin in 1921 and transferred it again to Tel-Aviv, Palestine, in 1924. By its wide publication of Hebrew literature, both old and new, this firm decisively promoted the revival of Hebrew as a living language in the first quarter of the 20th century. Bialik became a leading figure in this movement. His poetry extended the range of the Hebrew tongue. He also translated Russian, German, and Yiddish literary works into Hebrew. In 1901 he published a number of volumes of poetry, including *Songs of Wrath*, poems of protest against pogroms. Some of his poems appeared in English in 1924. After 1908 Bialik spent comparatively little time on the writing of poetry, devoting himself to comment and debate on Jewish problems and to the cause of Zionism.

BIALYSTOK (Russ. *Belostok*), capital of the province of the same name, Poland, on the Bialy R., a tributary of the Narew, about 105 miles N.E. of Warsaw. The city is the second-largest center of the Polish textile industry Leather, hats, soap, and silk are also manufactured there. The city was founded in 1320. It became part of Prussia by the third partition of Poland in 1795; taken by Russia in 1807, it remained Russian until 1919, when Poland regained it. In each of the World Wars the city was captured by the Germans. The province is a plain traversed by the Bug, Niemen, Narew, and Bobr rivers. Rye, potatoes, oats, hemp, and flax are the chief agricultural products. Area of province, 8705 sq.m.; pop. (1946) 917,563. Pop. of city (1950 est.) 65,800.

BIARD, PIERRE (1565–1622), French missionary, born in Grenoble. He was one of the first two French missionary priests sent to the New World. He arrived at Port Royal (now Annapolis Royal, Nova Scotia) in 1611, and soon afterward began the study of the Indian language. In 1612 he traveled up the Kennebec River and established friendly relations with the Indians; the next year he proceeded as far as the Penobscot R., and founded, on Mount Desert Island, a colony which he hoped to make a permanent settlement. This was destroyed by an English military force, however, and Biard was taken prisoner and transported to England. The attack marked the first actual hostilities between the French and English settlers in America. Biard was subsequently liberated and returned to



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Copy of the Gutenberg Bible, printed in 1456

Lyon. His *Relation de la Nouvelle France, et du Voyage des Pères Jesuits dans cette Contrée* is the first volume of the series of *Jesuit Relations* (40 vols., 1632–72), which constitutes one of the most valuable sources of early American history. Another important work in this series is his *Relatio Expeditionis Anglorum in Canadam suæque ab illis Comprehensionis.*

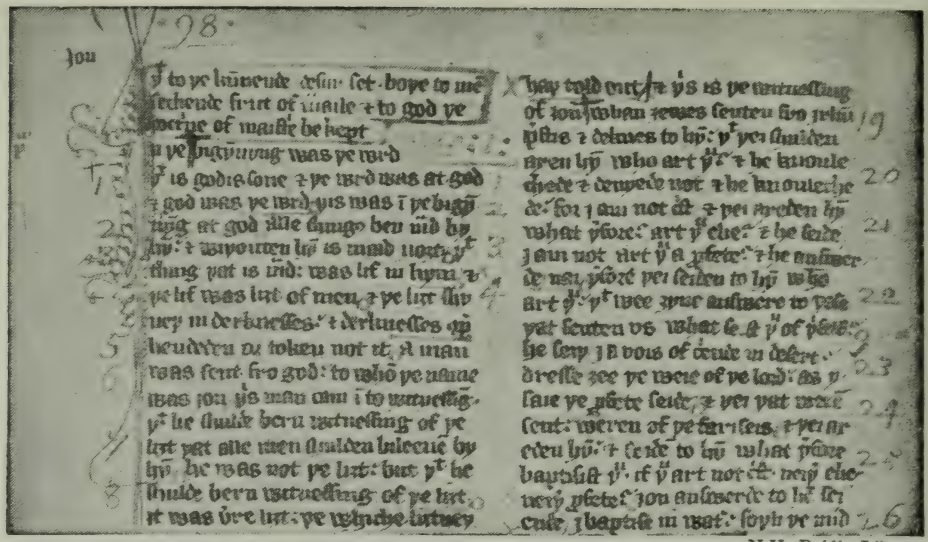
BIARRITZ, town of the department of Basses-Pyrénées, France, situated on the Bay of Biscay, 6 miles S.W. of Bayonne. The town is a health and vacation resort, popular in both summer and winter. Its facilities include excellent beaches and mineral springs. Pop. (1946) 22,447.

BIAS OF PRIENE (fl. 6th cent. B.C.), Greek sage, born in Priene, Ionia. He is remembered as one of the Seven Wise Men of Greece (q.v.). Few details of his life are known, but he acquired a reputation for sagacity, chiefly as a practical philosopher and in his understanding of civic virtue and justice. Many maxims attributed to him are extant.

BIBLE (Gr. *biblia*, pl. of *biblion*, dim. of *biblos*, "book"), designation applied to the collection of sacred writings universally regarded by orthodox Christians as divinely inspired. The word is employed also to designate the sacred Scriptures of the Jews. Numerous other terms, some of which were coined by the authors of the holy writings, are used by Christians synonymously with "Bible". Among these are The Scriptures, The Holy Scriptures, and The Word of God. The terms The Word of Truth, The Book of Books, The Holy Book, and The Sacred Book often occur in literary usage.

The Bible has two major divisions, the Old Testament and the New Testament (qq.v.). Of these, only the Old Testament is accepted in the Jewish religion. The order of arrangement of the component books of the Bible is not always uniform in different versions. Certain of the books, known as Deuterocanonical Books (q.v.), are included in Roman Catholic editions of the Bible and usually excluded from Protestant versions. In Protestant denominations these books are called the Apocrypha (q.v.). Complete or abridged editions of the Bible have been published in more than six hundred languages.

The Bible is largely the product of the spiritual, intellectual, and political experiences of the Israelites over many centuries. Some of the earliest poems of the Old Testament date at least from 1200 B.C., and the latest writing of the New Testament probably dates from about 150 A.D. The crystallization of faith which took place in the course of this immense span of time represented man's emergence from polytheism. The Bible, which marked the completion of that historic process, profoundly influenced the development of Juda-



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Portion of a page from a 14th-century Wycliffe Bible, in English

ism, Christianity, and Mohammedanism (qq.v.).

Texts of the Bible. Because of the antiquity of the Bible, little of an authentic nature is known regarding the authorship of some of its parts. These are generally recognized as the work of a large number of prophets, priests, sages, psalmists, apostles, and scribes, few of whose names are known. Some of the books of the Bible are regarded as composites, containing material from various sources, welded together in their present form by copyists. The Book of Proverbs, for example, probably embodies the synthesized experience of many wise men who lived at different places and studied life from many different points of view. Except as noted below, the entire Old Testament was written originally in Hebrew, an excellent medium, by reason of its directness, simplicity, and picturesqueness, for the storyteller, the poet, the orator, and the teacher of ethics. The language used in part of Daniel, one of the last books, was Aramaic; this language gradually supplanted Hebrew among the Jews after their exile in Babylonia. The New Testament was written in Koine, a popular Greek dialect developed in the Near East after the conquests (322 B.C.) of Tyre, Gaza, and Egypt by Alexander the Great.

None of the autographs of the Bible is extant. The original texts were written on skins or papyrus, which proved perishable. However, scholars and copyists of successive generations in antiquity executed generally faithful copies of the originals. As this process continued, serious inaccuracies and errors were incorporated into the various texts. This condition presented subsequent scholars, particularly in the Christian era, with an extremely complex task of textual criticism, a laborious search for the original words and meanings of the Biblical writers. In modern times, textual criticism has been greatly facilitated by the study of ancient manuscripts which contain, either in whole or in part, valuable early texts of the Bible. These include *Codex Sinaiticus* and *Codex Vaticanus*, both written in Greek in the 4th century A.D.; *Codex Alexandrinus*, written in Greek in the 5th century A.D.; *Codex Bezæ*, written in Greek and Latin in the 5th or 6th century A.D.; and *Codex Aaron* (*Ben Moses*) *Ben Asher*, written in Hebrew in the 9th century A.D.

The first known translation (from the Hebrew) of any portion of the Bible was probably begun (about 270 B.C.) at Alexandria during the reign of the Egyptian king Ptolemy II. Done in Greek, it consisted of the Pentateuch (q.v.), the first five books of the Old Testament. The name applied to the translation was Septuagint (q.v.), which became, on completion (late in the 1st century B.C.) of the translation of the remaining books, the designation of the entire Old Testament. Other reliable versions of the Septuagint were subsequently executed, notably those done in the 2nd century A.D. by the Jewish scholar Aquila Ponticus, and by several other trans-

lators. Another important translation of the Old Testament, the Peshito, was done in Syriac from the Hebrew probably in the 2nd century A.D. The Masoretic text, compiled by a guild of Hebrew scholars between the 6th and 8th centuries A.D., preserved the traditional Hebrew text.

Among the outstanding achievements in Biblical textual criticism was the Hexapla, done by the Alexandrian theologian Origen in the first half of the 3rd century A.D. The Hexapla contained the texts (arranged in six parallel columns) of the Septuagint, the Hebrew, the Hebrew transliterated into Greek letters, and the Greek versions by the translators Aquila Ponticus, Symmachus, and Theodotion. In the reconstruction of the Hexapla, the chief source has been a Syriac translation completed in 617. A version of the Old Testament was also made in Latin, about the end of the 3rd century, but this now exists only in fragmentary form. Various copies of the New Testament, in Greek, Old Latin, and Syriac, had been executed, meanwhile, and beginning in the 4th century many manuscripts, some of which are extant, were circulated throughout Christendom.

Late in the 4th century, the Roman Church Father St. Jerome completed the first Latin translation of the Bible as a whole. The Old Testament portions of this work, known later as the Vulgate (q.v.), were taken chiefly from Hebrew texts and the Septuagint, but the New Testament was mainly a revision of Old Latin texts. The Vulgate eventually became the standard Bible of the Roman Catholic Church, a status it still retains. The English religious reformer John Wycliffe, chief collaborator in the first complete translation (late 14th cent.) of the Scriptures into English, used the Vulgate text. The Vulgate was printed for the first time in 1456, probably by Johann Gutenberg, the inventor of printing. Several copies of this work, known as the Gutenberg Bible, have been preserved.

See VERSIONS OF THE BIBLE.

Christian Interpretations of the Bible. In Christian theology, the history of Biblical interpretation may be classified generally according to four historic epochs. The first, or ancient, period, extending from the initial stages of the development of the religion to medieval times, is characterized largely by emphasis on the allegorical significance of the Bible, particularly with regard to passages which appeared to be at variance with fact or truth in a literal sense. Throughout this period, the Church Fathers vigorously encouraged study of the Bible among the laity. The primitive Church, while developing numerous ecclesiastical traditions uncanonical in nature, nonetheless regarded the Scriptures as its final authority. Fusion of Church and Biblical tradition inevitably resulted, a development best formulated by the Scholastic philosopher Thomas Aquinas, who taught that the authority of the Church and the authority of the Bible are indistinguishable.

The medieval stage of Biblical interpretation was marked, in the beginning by the appearance of intellectual aggressiveness among Christian theological students. As a result of this spirit of inquiry, which necessitated vindication of the faith, the Church Fathers intensified the allegorical method of demonstrating Scriptural truth and discouraged Bible reading among the laity. The inevitable consequences were increasing use of the Bible in justification of certain rituals in the Church, on the one hand, and the development of tendencies regarded as heretical by the Church, on the other. The lack of harmony between Church tradition and scriptural authority implicit in these tendencies paved the way for the Protestant Reformation (see REFORMATION), the next significant stage in the Biblical interpretative process.

The outstanding Protestant theologians, including Martin Luther, Melanchthon, and John Calvin, took the position that it was not the Church which should decide what the Scriptures should teach. On the contrary, they declared that the teachings of the Church must be determined by the Scriptures. The growth of this idea was furthered by the deepening conviction that the Church was unable, morally or intellectually, to convey Scriptural truth to the people. Insistence on the sole authority of the Bible in matters of faith emerged as the fundamental characteristic of the interpretative thought of the Reformation. Not only was the literal sense of the Scriptures considered sufficient for spiritual illumination, but the Bible was regarded as its own interpreter, providing solutions to all questions relating to salvation. As a consequence, the determination of scriptural meaning devolved upon the individual student. Private judgment came to be not only a fact of criticism, but a right of religion.

Having secured the political right to their various doctrines, the opposing Protestant denominations which subsequently developed were compelled to maintain them against one another as well as against the teachings of the Church. At this time Bible interpretation be-

came largely a matter of justification of denominational needs. One consequence of this Protestant scholasticism was the violent persecution of various minor religious sects, notably the Quakers, by the fundamentalists of the 17th century.

The reaction to this dogmatic spirit in Biblical interpretation was the philosophical movement known as Rationalism, initiated by the French philosopher René Descartes. In the Rationalist school of thought, reason became the supreme arbiter in questions of scriptural meaning. The Rationalists were antisupernatural, and ridiculed, by emphasizing discrepancies in the Bible, confessional dependence on mechanical inspiration. While recognizing the moral teachings of the Bible and its literary qualities, they demanded natural explanations of the Scriptural miracles. In the period of general skepticism that ensued, Rationalism met little effective opposition from orthodox theology.

Bible interpretation in the modern period, an era of vast advance in the natural sciences, has been marked by an ever-widening era of disagreement between many theologians, insistent on the inerrancy of the Scriptures, and rationalist thinkers. The failure to reconcile Scriptural and scientific teachings became especially pronounced following Charles Robert Darwin's enunciation of his theory of evolution. Attempts by liberal churchmen to reconcile the conflicting viewpoints have been rejected by Roman Catholic theologians, notably Pope Leo XIII (1878–1903), whose encyclical letter *Providentissimus* categorically forbade admission of the possibility of Scriptural error. Many leading Protestant churchmen are in agreement with Roman Catholic doctrine on this question. In the United States their conservatism attained an organized character in the early years of the 20th century, with the advent of the Fundamentalist movement, which was militantly directed against those who refused to accept certain points of orthodox doctrine, including the inerrancy of the Scriptures. See EXEGESIS; FUNDAMENTALISM.

Modern Christian thinkers who oppose the position of the Roman Catholic Church and of the Fundamentalists hesitate to accept the Bible as a manual of theology. In their view the Scriptures are a profound reservoir of religious experience which provides inspirational guidance for personal religious faith.

The Bible as Literature. In addition to the sacred role which it plays in theology, the Bible ranks high among man's greatest literary masterpieces. In it is represented almost every form of literature, from lyric poetry to philosophical dialogue, including hymns, parables, fables, war songs, laments, epigrams, proverbs, stories, biographies, epistles, orations, genealogies, revelations, and prayers.

The subjects treated in the Bible are as varied as the literary forms. The Biblical writers were concerned with almost every phase of human life and thought. Nothing that affected man was beneath their attention. Among the more specific characteristics of Biblical writing are its naturalness and simplicity, its reflection of a love of nature, its reflection of a divine purpose for good realizing itself in life, and its exalted moral tone. The Old Testament, in particular, contains much writing of literary merit. Many of its passages and a number of its books are unsurpassed in dramatic force and grandeur. This is notably the case in the book of Job, as well as in certain of the Psalms and in the oracles of Isaiah. The New Testament, consisting of the writings of teachers concerned chiefly with the exposition of Christianity, does not generally attain the literary stature of the Old Testament. However, certain portions of the Gospels and a number of St. Paul's appeals and rhapsodies rival in literary excellence the best passages of the Old Testament. Much of the sublime beauty in the verse and prose of the Bible has been retained by its English translators. See BIBLE, ENGLISH TRANSLATIONS OF.

BIBLE ARCHEOLOGY, the scientific study of those material remains and records of the ancient past which relate to the historical background of the Jewish and Christian religions, and are therefore useful in elucidating the Old and New Testaments of the Bible.

Archeological research in Egypt, in the territories which were in Biblical days Assyria, Babylonia, Chaldea, Persia, Canaan, and Sinai, and in these and other lands traveled and inhabited by the early Christians, has resulted in the correction of many mistaken beliefs about the periods described in the Bible, and in the verification of the Biblical account of many historical events. In general, archeology may be said to support the view that the Bible is a valid historical narrative.

The following are among the important researches which cast light on the Old Testament as history.

The excavation at Jerusalem, Palestine, by archeologists of the Palestine Exploration Fund, and by other archeologists, uncovered the system used by the pre-Israelite inhabi-

tants of that city to draw water into the city from the Ain Sitti Maryan ("Fountain of the Virgin"). The unearthing of the remains of a breached wall indicated the course followed by David in his conquest of Jerusalem, as recounted in II Samuel 5:8 and in I Chronicles 11:6. Other discoveries at Jerusalem include the rock on which Solomon probably erected the first Temple, as indicated in I Kings 6:1.

The excavation of the remains of the Assyrian city of Nineveh, on the Tigris River, opposite the site of the present city of Mosul, Iraq, begun in 1845, in 1853 uncovered the great library of the Assyrian king Ashurbanipal. This library, dating from the 7th century B.C., contained Assyrian versions of Babylonian stories of the creation and flood.

The excavation in Iraq of the remains of Babylon by the Deutsche Orientgesellschaft, beginning in 1899, unearthed cuneiform tablets establishing the historical existence of Jehoiachin, King of Judah in the 6th century B.C., mentioned in I Chronicles 3:17 and in II Kings 25:27-30.

The excavation in Palestine of the site of the Canaanite city of Jericho by the German Orientalist Ernest Sellin from 1907 to 1909 and by the English archeologist John Garstang from 1930 to 1936 led scholars to place the construction of Jericho at about 1500 B.C. and its fall at some time in the 15th or 14th century B.C.

The excavation in Iran of the ruins of the ancient Persian city of Persepolis by the Oriental Institute of the University of Chicago, between 1931 and 1939, brought to light records establishing the Persian king Xerxes I as the Ahasuerus mentioned in Esther 1:1 and in other references.

The excavation at Tel ed-Duweir, Palestine, of the ruins of the ancient Canaanite city of Lachish by the Wellcome-Marston Archeological Expedition unearthed, in 1935, eighteen Hebrew potsherds, containing data relating to the conquest of Palestine by Nebuchadnezzar II in the 6th century B.C., and establishing the historical accuracy of that conquest as recounted in Jeremiah 34:7 and 42:1.

The following are among the important archeological researches relating to the New Testament.

The excavation at Tell Hum, Palestine, of the ruins of the ancient city of Capernaum by Franciscan monks unearthed the synagogue at which, according to Mark 1:21 and Luke 4:31, Jesus taught.

The excavation in Asiatic Turkey, of the Hellenistic temple of Artemis, one of the seven wonders of the ancient world, near the site of ancient Ephesus, and of the Roman theater in Ephesus, in the years from 1863 to 1869, confirmed references, made in Acts 19:28, 29 and 34, to Ephesus and to the preaching there of the Apostle Paul.

Papyri were discovered, from about 1877 to the beginning of World War II, principally in the Libyan desert of Egypt, written in the Koine, or common Greek language of the lower classes of the Greco-Roman world; Koine is also the language of the New Testament. These papyri contain letters identical in their opening and closing style with the New Testament epistles of Paul to the Thessalonians, Corinthians, Romans, Philippians, Colossians, Ephesians, and Galatians.

The excavation in Syria, from 1931 to 1933, of the ancient Seleucid city of Dura-Europos disclosed the remains of a Jewish synagogue and its ornamental paintings, and an early Christian home used as a place of worship and its paintings, demonstrating the origin of Christian art in Jewish religious art, and confirming numerous references to the use of houses as places of worship by the Apostles and early Christian congregations, as referred to in Acts 12:12, 16:14f, 18:7, 20:8, and 21:8 and 28-30f.

BIBLE, ENGLISH TRANSLATIONS OF, the Holy Scriptures in English vernacular. Prior to the 14th century, the only complete Bibles in England were in the Latin text, used by the clergy. Passages of the Bible were translated from Latin into Anglo-Saxon, however, as early as the 7th century, when some passages provided material for Caedmon, the first English poet. In the following century the English scholar and theologian Bede made a partial translation of the Gospel of St. John. Other significant translations from the Scriptures in the Anglo-Saxon period were made by the scholar Alcuin, King Alfred, and the grammarian Ælfric. Virtually all the Scriptural manuscripts that circulated in England during the period of Norman dominance, following 1066, were in either French or Anglo-Norman, both unintelligible to the majority of the people. Although various books and parts of the Bible appeared in English during the first half of the 14th century, the first full translation was that completed in 1384 by the religious reformer John Wycliffe.

For nearly three quarters of a century after the printing of the first Bible in Germany, only manuscript copies of Wycliffe's Bible were available in England. The first printed Scriptural writing in English translation was a

version of the New Testament completed in 1524 by William Tyndale, an outspoken critic of the Roman Catholic Church. Based on the Greek and Hebrew texts, this work was printed in Germany and smuggled into England. Tyndale subsequently translated the Pentateuch (1530) and other parts of the Old Testament, all of which were printed on the Continent. Tyndale's style is characterized by the use of popular idiom and by a simple, rhythmic prose which eventually became the pattern for the *Authorized Version* of the English Bible (see below).

The first complete translation of the Scriptures to appear in English print was made by the clergyman Miles Coverdale. This work, completed in 1535, was based chiefly on the Vulgate and the versions of other translators, including Tyndale and the German religious reformer Martin Luther. In the next four years three additional versions of the Bible were issued in England: *Matthew's Bible* (1537), prepared by John Rogers, the English martyr, mainly from Tyndale's and Coverdale's works; *Taverner's Bible*, a revision, by the English religious reformer Richard Taverner, of *Matthew's Bible*; and the *Great Bible*, edited by Miles Coverdale and published in several editions. The second of these became known as *Cranmer's Bible*, in honor of Thomas Cranmer, Archbishop of Canterbury, who wrote a preface to it. The next important version of the Bible in English was prepared in 1560, in Geneva, Switzerland, by numerous leaders and scholars of the Reformation who were in exile. Known officially as the *Geneva Bible*, it contained several innovations, including the division of chapters into numbered verses. Miles Coverdale and the English prelate William Whittingham were among the editors of this work, which became popular among the Puritans. The *Geneva Bible* was followed, in 1568, by the *Bishops' Bible*, a revision of the *Great Bible*, by Church of England scholars and bishops. In 1582 a commission of the Roman Catholic Church in England issued an official version of the New Testament. The entire Bible, completed in 1609, is known as the *Douai* or *Douai-Rheims Bible*. A translation of the Vulgate (q.v.), it is the standard Roman Catholic version in English of the Scriptures. However, a new version has been in preparation by the Church since 1908. Of this version, the New Testament was completed and published in the United States in 1941; the Book of Genesis of the Old Testament, in 1949.

The most notable translation of the Bible in English is the *Authorized Version*, completed in 1611. Sponsored by King James I, and known as the *King James' Bible*, the *Authorized Version* is the work of forty-seven theologians and scholars, who completely revised the *Bishops' Bible* using Greek and Hebrew texts and earlier English translations. Its style, closely modeled after Tyndale's, and its spiritual content profoundly influenced the development of English literature during the next three centuries. A revision of the *Authorized Version*, containing an appendix of changes recommended by American scholars, was published in 1881. In 1901 an *American Standard Version*, incorporating these changes, was published. A committee of the International Council of Religious Education (now the Division of Christian Education of the National Council of Churches), representing forty leading Protestant denominations in the United States and Canada, began, in 1937, a comprehensive revision of the *American Standard Version*, with the object of utilizing data from newly discovered ancient papyri and of eliminating archaic terminology. *The Revised Standard Version of the New Testament*, first phase of this project to be completed, was published in 1946, and the entire work, known as *The Revised Standard Version*, was published in 1952.

BIBLE SOCIETY, an association having as its object the diffusion of the Scriptures. The first such association is said to have been formed in 1710 at Halle, Saxony. By 1834 the association had distributed 2,754,350 copies of the Bible, and about 2,000,000 copies of the New Testament. The English society, founded in 1780, is known as the *Naval and Military Bible Society*. In 1792 an association was formed in London under the name *French Bible Society*. The *British and Foreign Bible Society*, founded in 1804, has promoted the translation and distribution of the Bible in 450 languages and dialects. Bible societies now exist in all parts of Protestant Christendom. The three largest Bible societies in the world, the British and Foreign Bible Society, the American Bible Society (see BIBLE SOCIETY, AMERICAN), and the National Scottish Bible Society, have, since their founding, distributed well over 1 billion copies of the Scriptures.

BIBLE SOCIETY, AMERICAN, a society founded in New York City in 1816 to promote world-wide circulation of the Bible to all people without denominational or racial discrimination. The Bibles are distributed at cost price through the society's various agencies.

In 1952 the society distributed 16,001,945

volumes published in 149 different languages. Scriptures for the blind in Braille, Moon, New York Point, and other systems have been distributed since 1835. Each year several thousands of embossed volumes of the Scriptures, or talking book records of them, in 33 different languages are distributed in the United States and abroad. Membership in the society in 1953 was about 350,000.

During World War I the society distributed a total of over 6,800,000 volumes among the armed forces of the belligerent nations. In World War II over 14,500,000 copies of the Scriptures, in more than 40 languages, were distributed over a six-year period ending June 30, 1946. Almost 9,000,000 copies went to the armed forces, over 3,000,000 to people in liberated areas, and about 2,500,000 to prisoners of war. From the date of its organization, May 1816, to 1952, the society distributed 422,423,955 copies of the Scriptures.

The official publication of the society is the *Bible Society Record*. Headquarters are in New York City.

BIBLIOGRAPHY (late Gr. *bibliographia*, "the writing of books"), originally, the writing or copying of books. In modern times the word is generally applied to the listing of books with notices of their authors, editions, dates and places of publication, style of type, and other related details, as distinct from the collection and classification of books as practiced by librarians. The modern meaning of the word dates from about the middle of the 18th century. By extension, the word "bibliography" is applied to many types of listings of publications. Bibliographies may be general, including works on a wide variety of subjects, published in a number of countries and periods; or they may be selective. In the latter case they may be limited to works on a single subject, works published in a given place or time, or works by a single writer. Bibliographies of works published on a single subject are often appended to other works. Those dealing with the works of individual authors are often included either in biographies or in editions of the authors' collected works. Writers frequently append to their books bibliographies of the sources of their material. Bibliographies are now indispensable for book collectors and antiquaries, librarians, booksellers and bookbuyers, students, and a variety of specialists engaged in various commercial and cultural pursuits.

It has long been an ideal of bibliographers to compile a work which would cover the whole realm of printed books. The most notable though not the earliest attempt to achieve this aim was *Bibliotheca Universalis* (4 vols., 1545–49), by the Swiss naturalist Konrad von Gesner. Gesner recorded, under the names of their authors, all the books in Hebrew, Greek, and Latin about which he could obtain information. Since Gesner's time there have been many others who have attempted to compile a universal catalogue, among them Robert Watt of Edinburgh, who prepared the *Bibliotheca Britannica* (4 vols., 1824). But the latter's work, in respect to foreign books, is selective and not universal. Its greatest use is in connection with works by British writers.

Other outstanding general bibliographies are *Manuel du Libraire et de l'Amateur des Livres* (1810) by the French bibliographer Jacques Charles Brunet, and *Allgemeines Bibliographisches Lexicon* (2 vols., 1821–30) by the German bibliographer Friedrich Adolf Ebert (1791–1834). The library of the British Museum, in London, has so large a collection of books that its *Catalogue* of *Printed Books* (108 vols., 1881–1905) is one of the most important general bibliographies.

Important specialized bibliographies of British works, besides those already mentioned, include *The Bibliographer's Manual of English Literature* (4 vols., 1834) by the English bibliographer William Lowndes, the first systematic bibliographic compilation on this subject made in England; the *Reference Catalogue of Current Literature*, a quadrennial publication of publishers' lists; and the trade publication *Book Prices Current*.

An important specialized bibliography of American publications is *American Bibliography, 1639–1820* (12 vols., 1903–34) by the American bibliographer Charles Evans (1850–1935). Other bibliographies of American publications include the trade publications *Publisher's Weekly*, which appeared for the first time in 1872, the monthly *United States Catalogue* (successor to the *American Catalogue*), the *Cumulative Book Index*, the *Standard Catalog for Public Libraries*, *The Publisher's Trade List Annual*, and *American Book Prices Current*.

Bibliographical literature has increased to such an extent that many works have been published which list and describe bibliographies. The best known of these is the German Julius Petzholdt's *Bibliotheca Bibliographica* (1866) which the Frenchman Henri Stein revised under the title *Manuel de Bibliographie Générale* (1897). Of great value to the general reader is the *List of Bibliographical Works in the*

Reading Room of the British Museum (1889), and one of the most useful of all such lists is the Englishman William Courtney's *Register of National Bibliography* (1905–12). In 1901 the Bibliographical Society of Chicago printed as its first publication a *Bibliography of Bibliographies Chronologically Arranged*; a second edition of this work was issued by the Bibliographical Society of America in 1910–11.

BIBLIOMANIA (Gr. *biblion*, "book"; *mania*, "madness"), literally, a mania or passion for books. The word is generally used to denote an interest in the acquisition of rare or otherwise exceptional books, and is sometimes restricted to the activities of bibliophiles, or book collectors who specialize in these items. The rarity and value of a book are determined by a variety of methods, based upon widely dissimilar criteria, many of which are irrelevant to the literary merit of the work. Books may be artificially made rare and valuable by limiting the number of copies printed and by the use of handset type, handmade paper, and costly reproduction processes and binding materials. The most desirable books, however, generally acquire their value by a combination of historical associations and the specific circumstances of their publication. For example, the first editions of books by many well-known authors, particularly those whose reputations were established posthumously or late in their writing careers, are often small in number and therefore valuable. Books published during the earlier phases of printing, from about the middle of the 15th to the end of the 17th century, were invariably issued in comparatively small editions, and they become increasingly valuable by inevitable losses of, and injuries to, surviving copies through the years.

A special category of rare books consists of those which are arbitrarily valuable to bibliophiles because of defects in printing or binding, such as a defective cover, a missing or a superfluous title page, or a significant typographical error. Finally, some otherwise commonplace books are rendered valuable in the rare-book market by virtue of their previous illustrious owners and, in some cases, by inscriptions or marginal comments inserted by these owners. Two types of nonprinted matter also figure as objects of value to the bibliomaniac: books handwritten and bound before the invention of printing, and usually richly embellished with ornamental letters and illustrations (see ILLUMINATED MANUSCRIPTS); and original authors' manuscripts. The first category has intrinsic artistic and historical importance; the second is often of interest to scholars and critics because of changes and corrections made by the author in the course of creation.

The history of bibliomania dates from the beginning of the 19th century. One of the earliest notable sales took place in London, England, in 1812, when a copy of the first edition of the *Decameron* by the Italian writer Giovanni Boccaccio was purchased for £2260, probably the highest price ever paid for a single book up to that time. London became the center of the international rare-book market in the 19th century, and certain books became established as standards of historical importance, rarity, and value. Notable among such books are copies of the Bible in two volumes issued from 1450 to 1455 in Germany by the German printers Johann Gutenberg and Johann Fust, and generally known as the "Gutenberg Bible"; the Aldine editions, issued during the late-15th and 16th centuries by the Italian printer Aldus Manutius, and notable for their beauty of type and binding; and the first edition of the collected plays of William Shakespeare, issued in London, England, in a folio edition in 1623, and generally known as the "First Folio".

About the end of the 19th century the center of bibliomaniac activity gradually shifted to America. Rare books most sought after by American collectors may be classed as follows: the earliest printed books and first editions of the classics; first editions of English writers of the 16th and 17th centuries, especially poets and dramatists; books relating to America, particularly narratives and accounts of the earliest explorers and colonists; and the first books printed on American presses. The prices which exceptionally rare books now command may be indicated by a list of some recent sales. Between 1944 and 1946, $50,000 was paid for the original manuscript of *Alice's Adventures Underground* (later expanded and published as *Alice's Adventures in Wonderland*), by the English writer Lewis Carroll; $23,000 for the proof sheets, corrected by the author, of a suppressed first edition of the same book; $13,000 for a defective copy of the first edition of the *Canterbury Tales*, by the English poet Geoffrey Chaucer; and $50,000 for a Shakespeare First Folio. The most valuable book printed in America is generally considered to be *The Whole Booke of Psalmes* (generally known as the *Bay Psalm Book*), originally published in Cambridge, Mass., by the American colonial printer Stephen Daye. In 1947 a copy of this work, the first book printed in the

American colonies of Great Britain, was sold for the record price of $151,000.

BIBLIOTHÈQUE NATIONALE, French National Library, situated in Paris, and the largest library in France. It contains about 4,000,000 printed volumes, 125,000 volumes of manuscript, 500,000 volumes of periodicals, and over 250,000 engravings. The two chief sources of its origin were the Bibliothèque du Roi, founded in 1367 by King Charles V in the Louvre, Paris, and the library of the Orleans family at Blois. These libraries were united by Francis I at Fontainebleau, and were later transferred to the Collège de Clermont in Paris by Charles IX. The library is now in the Rue Richelieu. A decree of 1536 required that one copy of every work printed in France be filed in the National Library. See LIBRARIES.

BICAMERAL SYSTEM, the legislative system in which the power of making the law is vested in two chambers, or houses, both of which must approve a bill before it becomes law. In general the upper house is composed of members selected on a territorial basis, representing states or other political subdivisions rather than the people directly, and usually serving for longer terms than the members of the lower house. In principle the upper house provides the legislative experience necessary to control unwise legislation. The lower house is generally composed of members selected on a population basis, each member representing an equal number of citizens. Because of more frequent election and closer identification with the districts they represent, members of the lower house reflect more strongly the contemporary mind of the electorate. Typical of the bicameral system is the U.S. Congress, which consists of a Senate, constituting an upper house, and a House of Representatives, constituting a lower. The bicameral system is in force in all of the States with the exception, since 1937, of Nebraska, which has a unicameral, or single-chamber, legislature. Throughout the world national parliaments are about equally divided between the bicameral and unicameral systems.

BICHAT, MARIE FRANÇOIS XAVIER (1771–1802), French physician, born in Thoirette, Jura, and educated in the hospitals of Lyon and Paris. He became well known as surgeon, laboratory anatomist, and physician in the Hôtel-Dieu in Paris. Bichat was the first to demonstrate that the different organs are composed of similar tissues Through this discovery he was able to simplify and to systematize both anatomy and physiology. His principal work is *Anatomie Générale, Appliquée à la Physiologie et à la Médecine* (2 vols., 1801).

BICHIR, common name for a fish, *Polypterus bichir*, found in the upper Nile and other large, tropical African rivers. In the young bichir, the gills are external; in the adult, the gills are internal, and the double swim bladder serves as an accessory organ of respiration. The bichir uses its padlike pectoral fins as limbs in creeping over the bottom. The species is of particular interest as one of the few remaining representatives of the once-extensive ganoid order Crossopterygii.

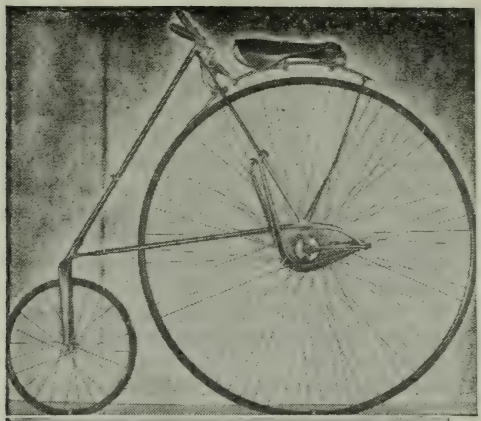
BICHLORIDE OF MERCURY. See MERCURIC CHLORIDE.

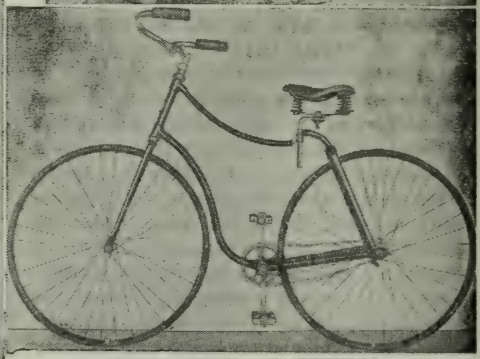
BICKERSTAFF, ISAAC, pseudonym used on occasion by three 18th-century authors. It was first used in 1708, by the English author Jonathan Swift in his *Predictions for the Ensuing Year*, a burlesque almanac. The name was later adopted by the English author Richard Steele, who signed it to essays in the periodical the *Tatler* (1709–11). Benjamin West, an American almanac maker, also used the pseudonym, in an almanac first published in Boston, Mass., in 1768.

BICYCLE, a vehicle consisting of two wheels fixed in tandem to a frame, steered by handle bars, and propelled by an arrangement of pedals and gears driven by the feet. The name of the modern vehicle dates from 1869; various precursors of this machine were known as *velocipedes*, a French name dating from the late 18th century.

Little is known of the earliest history of the bicycle, though crude two-wheeled vehicles propelled by the feet were popular as early as the second half of the 17th century. In 1690 a Frenchman invented the *celerifere*, consisting essentially of a wooden beam to which the wheels were affixed. The rider sat on a cushion on the beam and propelled the machine by pushing his feet against the ground; he steered the vehicle, which had no handle bar, by the action of his feet on the ground. The *velocifere*, popular during the French Revolution; the *accelerator*, brought out in 1799; and the *celeripede*, invented in 1810, introduced no great advances in design.

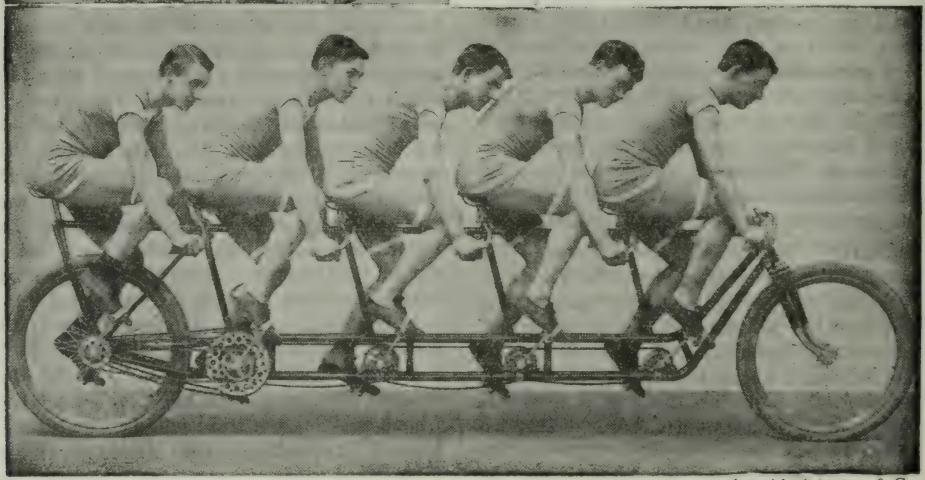
In Germany, in 1816, Baron Karl von Drais designed the first two-wheeled vehicle with a steering device. This machine, named the *draisine*, had a handle bar pivoted to the frame, enabling the front wheel to be turned. Various improvements were developed thereafter by French, German, and English in-





EARLY TYPES OF BICYCLES

Top, left: One type of bicycle used in 1880. Top, right: 1818 curricle, or "dandy horse." Left: French "boneshaker," 1855 model. Above: American safety bicycle used in 1886. Below: Five-man tandem racing bicycle, 1890.



Arnold, Schwinn & Co.

ventors. In England these early models were generally known as "hobby horses", probably as a simple description of a transportation medium. The name "dandy horse" was applied particularly to the expensive *pedestrian curricle*, invented in 1818. Although the curricle, lighter in weight than the draisine, and with an adjustable saddle and elbow-rest, was patented in the United States in 1819, it aroused little interest.

In 1839 driving levers and pedals were added to a machine of the draisine type, enabling the rider, for the first time, to propel the machine with his feet off the ground. The driving mechanism of this vehicle consisted of short cranks fixed to the rear wheel hub and connected by rods to long levers hinged to the frame close to its head. The connecting rods were joined to the levers at about one third of their length from the pedals, the foot action thus obtained being a downward and forward thrust. In 1846 an improved model of this machine, designed by the Scotchman Galvin Dalzell, acquired the name the *Dalzell* and was widely used in England.

The direct progenitor of the modern bicycle was the French crank-driven, loose-pedaled velocipede, which became popular in France about 1855. The frame and wheels were made of wood; the tires were of iron, and the pedals were attached to the hub of the front or driver wheel, which was slightly higher than the rear wheel. In England this machine was known as the "boneshaker", because of its effect on a rider pedaling over a rough road or a cobblestoned street. In 1869, in England, solid rubber tires mounted on steel rims were introduced in a new machine, the first to be patented under the modern name of *bicycle*, and in 1873 James Starley, an Englishman, produced the first machine embodying most of the features of the *ordinary*, or high-wheel bicycle, the front wheel of which was as much as three times as large in diameter as the rear wheel.

The modifications and improvements of the next fifteen years included the ball bearing and the pneumatic tire. These inventions, along with the use of weldless steel tubing and spring seats, brought this type of bicycle to its highest point of development. Meanwhile the excessive vibration and instability of the high-wheel bicycle were causing inventors to turn their attention to reducing the height of the bicycle. About the year 1880 the so-called *safety*, or low, machine was developed. Its wheels were of nearly equal size, and the pedals, attached to a sprocket through gears and a chain, were adapted to drive the rear wheel.

The safety bicycle was universally adopted by manufacturers in the U.S. The improved safety machine had wheels of equal size, hollow steel tubing, coaster brake (i.e., a device incorporating both a braking mechanism and a free-wheeling arrangement for coasting), adjustable handle bars, and other improvements. American cyclists increased greatly in numbers and became strong supporters of a nationwide good roads movement. In 1899 the American production of about 1,000,000 bicycles a year was valued at more than $31,000,000. By 1909, however, the bicycle industry in the United States was nearly nonexistent—the motorcycle and the automobile having largely displaced the bicycle; bicycle riding was generally confined to children and to small groups of devotees, such as the members of the League of American Wheelmen (organized in 1880) and of the Century Road Club Association (organized in 1899). In European countries, however, the bicycle remained an important means of transportation.

In recent times the popularity of the bicycle has greatly increased. For several years prior to World War II, more than 1,000,000 bicycles were being produced annually in the United States for domestic use. It is estimated that about 15,000,000 bicycles are currently in use in the United States, and annual production has averaged about 2,000,000 since World War II. Great Britain manufactures more bicycles than any other country. In Europe more bicycles than automobiles are in use; in the United States automobiles outnumber bicycles more than 3 to 1.

Bicycle racing is popular as an amateur sport in Europe, and to some extent in the United States. Supervising the sport in the United States is the Amateur Bicycle League of America, an affiliate of the International Cyclist Union. Popular long-distance bicycle races include the professional six-day races in the United States, and the 3000-mile Tour of France and the 2500-mile Tour of Italy.

BIDAULT, GEORGES (1899–), French statesman, born in Moulins, and educated at the Sorbonne. Prior to World II he was foreign editor of the Catholic newspaper *l'Aube*; leader of the Popular Democratic Party, an organization of left-wing Catholics; and an outspoken opponent of the prewar appeasement of Germany which culminated in the Munich Pact (q.v.). He joined the French army at the outbreak of World War II, in

1939, and was taken prisoner by the Germans, but was released in 1941. Throughout the remainder of the war, Bidault was a leader of the underground resistance movement in France. He was arrested in 1943, but escaped his German captors, and later that year became president of the National Resistance Council, which he had previously helped to organize. In September, 1944, after the Allied invasion of France, Bidault became French minister of foreign affairs. He represented France at the United Nations Conference in San Francisco, Calif., in 1945, and at subsequent conferences of foreign ministers to discuss the formulation of terms of peace with Germany and Austria. From October, 1949, to June, 1950, he served as premier at the head of a coalition cabinet, and he was vice-premier and minister of defense from August, 1951, until February, 1952. He was foreign minister from January, 1953, to June, 1954.

BIDDEFORD, city of York Co., Maine, situated on the Saco R., opposite Saco and about 15 miles s.w. of Portland. It is an industrial center, with hydroelectric plants and diversified manufacturing industries. Important manufactures include shoes, textiles, machinery, and lumber. Granite quarrying and farming are leading industries in the surrounding region, and nearby are several summer resorts, notably Old Orchard Beach. Biddeford Pool, a coast resort within the city limits, was founded in 1616. The first settlement on the site of Biddeford proper was established in 1630. This settlement formed part of Saco until 1718, when it was incorporated as the town of Biddeford. The town was chartered as a city in 1855. Pop. (1950) 20,836.

BIDDLE, A(NTHONY) J(OSEPH) DREXEL (1874–1948), American journalist, publisher, and author, born in West Philadelphia, Pa., and educated at the University of Heidelberg, Germany. He returned to the United States in 1891 and shortly thereafter joined the editorial staff of the Philadelphia *Public Ledger.* In 1895 he re-established and became editor of the Philadelphia *Sunday Graphic,* and he was head of the Drexel Biddle book-publishing house from 1897 to 1904. Biddle's works include *The Madeira Islands* (2 vols., 1900), *The Land of the Wine* (2 vols. 1901), and *Do or Die, Military Manual of Advanced Science in Individual Combat* (1937).

BIDDLE, FRANCIS (1886–), American jurist, born in Paris, France, and educated at Harvard University. In 1911–12 Biddle served as private secretary to U.S. Supreme Court Justice Oliver Wendell Holmes. He was special assistant to the U.S. district attorney for Pennsylvania from 1922 to 1926, and in 1934–35 he served as chairman of the National Labor Relations Board. In rapid succession he became judge of the U.S. Circuit Court of Appeals (1939), U.S. solicitor general (1940), and U.S. attorney general (1941). In 1945 President Harry S. Truman appointed him the American member of the International Tribunal to try the major German war criminals after World War II. Truman appointed him a U.S. member of the Permanent Court of Arbitration at The Hague, the Netherlands, in 1951. He served in that post until 1957. Biddle is the author of *Mr. Justice Holmes* (1942), *Democratic Thinking and the War* (1944), *The World's Best Hope* (1949), and *The Fear of Freedom* (1951).

BIDDLE, GEORGE (1885–), American artist, born in Philadelphia, Pa., and educated at the Groton School and Harvard University. During World War II Biddle was chairman of the War Department Art Advisory Committee, and in 1943 he went to North Africa, Italy, and Sicily to take part in the making of a pictorial record of the fighting in that theater. In 1950 he was appointed to the Fine Arts Commission by President Harry S. Truman. Biddle is well known both for his murals, which include five frescoes in the Department of Justice Building, Washington, D.C., and others in the National Library, Rio de Janeiro, Brazil, and the Supreme Court Building, Mexico City; and for his easel paintings and lithographs which are part of the permanent collections of many museums, including the Metropolitan Museum of Art, the Whitney Museum of American Art, and the Museum of Modern Art, all in New York City; the Chicago Art Institute; and the Boston Museum of Fine Arts. Among his writings are *Green Island* (1930), *Boardman Robinson* (1937), *American Artist's Story* (1939), *Artist at War* (1944), and *George Biddle's War Drawings* (1944).

BIDDLE, JOHN (1615–62), English religious reformer, born in Wotton under Edge, Gloucestershire, and educated at Oxford University. He is generally regarded as the founder of Unitarianism in England. Biddle was imprisoned for a short time in 1645 for having written a denial of the deity of the Holy Spirit. The published statement of this opinion was burned, in 1647, by order of Parliament. Later publications of his views, which denied the doctrine of the Trinity, were also suppressed, and only because of the aid of the lord protector Oliver Cromwell did Biddle

escape execution as a heretic. Thereafter he was once exiled and several times imprisoned. He died in jail.

BIDPAI, PILPAY, or **PILPAI** (Skr. *vidyapati*, "master of knowledge"), the reputed author of a collection of Indian fables which were written in ancient times and later became famous throughout Asia and Europe. Bidpai's fables were derived from old Sanskrit tales. Two Sanskrit versions of the collection exist: the *Panchatantra* (q.v.); and a shorter version of this work called the *Hitopadesa*. The Persian king Khosrau I (531–79) caused the tales to be translated into Pahlavi, the literary language of Persia at the time. An 8th-century Arabic version is the earliest copy extant in any language; a 13th-century Latin translation of this version is the source of translations into most modern European languages. The fables of Bidpai are based on the principles of Buddhism (q.v.). The stories are simple and are interspersed with maxims and sayings of shrewd practical wisdom.

BIEL (Fr. *Bienne*), city of the canton of Bern, Switzerland, situated near the Lake of Biel, about 17 miles N.N.W. of Bern. It is an important railway junction and industrial center, with plants engaged in the manufacture of watches, clocks, machinery, textiles, paper, and cigars. The city was founded in the early years of the 13th century. Pop. (1950) 48,342.

BIELA'S COMET, a small comet named for the German astronomer Wilhelm von Biela. He first observed the comet on February 27, 1826, and later determined the elements of its orbit and calculated its period to be 6.7 years. Identified as a comet which had been seen twice before, it was observed again in 1832, but on its return in 1839 it passed too close to the sun to be seen from the earth. In January, 1846, it was observed to break into two parts which separated rapidly, and when the fragments passed from view in March, the two comets were 190,000 miles apart. Both comets were observed on their next return in 1852, and were found to be more than 1,500,000 miles apart. They have not been seen since. However, in 1872, when the comets were due to return, a shower of meteors was seen radiating from the point in the sky in which the comet should have appeared. The orbit of the swarm of meteors was determined, and was found to have a striking similarity to the orbit of the vanished comet. See COMET; METEOR.

BIELEFELD, city of North Rhine-Westphalia, West Germany, at the foot of the Teutoburger Wald ("Teutoburg Forest", actually a mountain range), 28 miles S.W. of Minden. It is an industrial center, with linen and silk factories, bleaching works, and plants engaged in the manufacture of furniture, glass, sewing machines, motor cars, and bicycles. The city was severely bombed in World War II. Pop. (1950) 153,613.

BIEL (Fr. *Bienne*), **LAKE OF,** a lake of Switzerland, situated in Bern Canton, in the Jura Mountains at an elevation of 1424 ft. It is about 10 m. long and from 1 to 3 m. wide and covers an area of about 16 sq.m. Its maximum depth is about 250 ft. The waters of Lake Neuchâtel, 3 m. to the S.W., reach the lake through the Suze and Thièle rivers. Near the N. extremity of the Lake of Biel is the city of Biel.

BIENNE. See BIEL.

BIENNE, LAKE OF. See BIEL, LAKE OF.

BIENNIALS, or BIENNIAL PLANTS, plants which normally require two years for their life cycle. They store food in the first season of their growth, flower and bear fruit in the second season, and then die. Familiar examples of biennial flowers are foxglove, hollyhock, and pansy. Many cultivated vegetables are biennials, such as carrots, turnips, parsnips, parsley, and celery. Biennials often become annuals when early sowing, warm weather, or other factors cause the earlier development of a flowering stem.

BIER, AUGUST (1861–1949), German physician, born in Helsen, and educated at the universities of Berlin, Kiel, and Leipzig. From 1907 to 1932 he was professor of surgery and director of the clinics at Berlin University. He was noted especially for his development of spinal anesthesia, osteoplasty in amputation, and a treatment for local hyperemia. In 1938 he was awarded the German National Prize, a substitute for the Nobel Prize (which under the National Socialist government Germans were not permitted to accept). Among his works is a standard treatise on hyperemia, translated into English under the title *Bier's Text-book of Hyperemia as Applied in Medicine and Surgery* (1909).

BIERCE, AMBROSE GWINETT (1842–1914?), American journalist and author, born in Meigs County, Ohio, and self-educated. He served with distinction in the Union army during the Civil War, and was breveted major. In 1872 he went to London, where he contributed ironic fables to the periodical *Fun*; these and several other works, notable for their sardonic, cynical wit, won him the nickname "Bitter Bierce". Returning to the U.S. in 1876, he contributed to the periodical *Overland Monthly*

and for many years to the "Prattle Columns" of the newspaper *San Francisco Examiner*. He edited the periodicals *Argonaut* and *The Wasp* in California from 1877 to 1884. In 1913, at the age of seventy-one, Bierce went to Mexico and disappeared soon afterward. Among his works are *The Fiend's Delight* (1872), *Cobwebs from an Empty Skull* (1874), *Can Such Things Be?* (1893), *In the Midst of Life* (1898), and *Devil's Dictionary* (1906). An edition of his collected works, in thirteen volumes, was published in 1913.

BIERSTADT, ALBERT (1830–1902), American landscape painter, born in Solingen, Germany, and trained at the Düsseldorf Academy, Germany, and privately in Rome, Italy. Bierstadt was a member of the so-called "Hudson River" school of American painting (see PAINTING, AMERICAN). Among his paintings are "Rocky Mountains" (1863, Metropolitan Museum of Art, New York City), "Valley of the Yosemite" (1866, New York Public Library, New York City), "Mount Corcoran" (1878, Corcoran Gallery, Washington, D.C.), and two historical paintings, "The Discovery of the Hudson River" and "The Settlement of California" (both in the Capitol, Washington, D.C.).

BIFROST, in Norse mythology, the rainbow bridge connecting Asgard (heaven) and Midgard (earth). The bridge was guarded by Heimdall (q.v.), sentinel of the gods. It was believed that one day the warriors of Muspelheim (land of fire) would rush across Bifrost to battle successfully against the gods, the bridge would collapse, and the whole universe would be consumed by fire.

BIGAMY, in law, the criminal offense of contracting a second marriage by one who is at the time still married to his or her original spouse. In the United States, a person can be tried for bigamy only by the courts of the State in which the second marriage occurs. The present statute in England continues this rule so far as aliens are concerned, but makes punishable in England the bigamous marriage of a British subject, wherever it may have been contracted. In some States of the United States a person who knowingly enters into a marriage with a bigamist is declared to be guilty of the same offense.

BIG BEN, name for a bell installed with a large clock in the tower of Westminster Palace, London, England, and named after the British statesman Sir Benjamin Hall, who was commissioner of works at the time of its installation. Constructed in 1854, the clock has four faces and is visible over a wide area. The Big Ben bell, used to strike the hours, was cast in 1858 and weighs about 13½ tons; its hammer is operated by a motor installed in 1913.

BIG BEND NATIONAL PARK, a Federal park of the United States, established in 1944 and situated in Brewster Co., Tex. Occupying 691,338 acres, the park has the general shape of a triangle, with its apex at a sharp bend in the Rio Grande R. The river demarcates the park's S.W. and S.E. limits and, in this part of its course, traverses a number of precipitous canyons. Several of these canyons, notably Santa Elena and Boquillas, are among the most spectacular in the United States. Other scenic features of the park include the Chisos Mountains, with a maximum elevation of 7835 ft., and large tracts of rugged desert.

BIGELOW, FRANK HAGAR (1851–1924), American meteorologist, born in Concord, Mass., and educated at Harvard University. He became successively assistant astronomer at the Córdoba Observatory, in Argentina; professor of mathematics at Racine College, Wisconsin; meteorologist at the U.S. Weather Bureau, Washington, D.C.; and professor of stellar physics at Columbia University. In 1910 he returned to South America, becoming professor of meteorology at the Argentine Meteorological Office and five years later director of the Pilar Solar and Magnetic Observatory. He invented an instrument for obtaining photographic records of stellar transits, and formulated theories to explain a connection among the solar corona, terrestrial magnetism, and the aurora. His writings include *Solar Corona* (1899), *Studies on the Thermodynamics of the Atmosphere* (1907), and *Treatise on Atmospheric Circulation and Radiation* (1915).

BIGGERS, EARL DERR (1884–1933), American author, born in Warren, Ohio, and educated at Harvard University. From 1908 to 1911 he was dramatic critic for the newspaper the Boston *Traveler*. Among his works are *Seven Keys to Baldpate* (1913), a mystery novel, dramatized and produced by the American actor and producer George M. Cohan with great success; the plays *Inside the Lines* (1915) and *A Cure for Curables* (1917); a book for a musical comedy, *See-saw* (1919); and the novels *The Chinese Parrot* (1926), *Charlie Chan Carries On* (1930), and *Keeper of the Keys* (1932). His character "Charlie Chan", a Chinese detective, was used as the central figure in a stage play and in many motion pictures.

Canadian National Railways

The Rocky Mountain bighorn

BIGGS, E(DWARD GEORGE) POWER (1906–), English organist, born in Westcliff, and educated at the Royal Academy of Music. He is widely known in Great Britain and North America as an organ recitalist and as a soloist with leading American symphony orchestras, including the Boston and the Chicago symphony orchestras. In 1952 the National Association of American Composers and Conductors cited him for his services to American music.

BIG HOLE BATTLEFIELD, national monument of the United States, established in 1910 and situated in Beaverhead Co., Mont., about 55 miles S.W. of Butte. Occupying 200 acres, it marks the site of a battle fought between Nez Percé Indians and United States troops on August 9, 1877. Though greatly outnumbered, the troops were victorious. A stone monument commemorates those slain in the battle.

BIGHORN, common name for any of the mountain sheep of western North America, so named because of their immense, semispiral horns. Mountain sheep were formerly common throughout the Rocky Mountain system from Mexico to the Arctic Circle; they are still numerous in Canada and parts of Alaska, but in the U.S. bighorns are scarce, except in Colorado, where they are protected by game laws. Hunting the wary, sure-footed mountain sheep is considered excellent sport, and their horns are highly prized as trophies.

The Rocky Mountain sheep, *Ovis canadensis,* is found chiefly in the U.S. It is grayish brown in color, and the rams may attain a length of 5 feet and a weight of 350 pounds; they stand 40 inches high at the shoulder, and the horns measure 40 to 50 inches along the outer curve. Dall's sheep, or the white mountain sheep, *O. dalli,* is found in the mountains of Alaska; it is slightly smaller, and white in color. The black mountain sheep, *O. stonei,* found in the Canadian Rockies, is iron gray in color; it is larger than the Rocky Mountain sheep, but has smaller horns.

BIG HORN MOUNTAINS, isolated range of the Rocky Mountains, lying E. of the Big Horn R. and extending generally northward from Natrona Co., Wyo., into southern Montana. The range has numerous peaks over 7000 ft. in elevation; its highest summit is Cloud Peak (13,165 ft.). Many streams rise on the western and eastern slopes of the range, and there are large coniferous forests along the upper levels. More than 1,000,000 acres of these forests are included in Big Horn National Forest.

BIG HORN RIVER, river of Wyoming and Montana, rising in w. central Wyoming. Formed by the junction of the Popo Agie and Wind rivers, it flows generally northward and empties into the Yellowstone R. in Treasure Co., Mont. The Big Horn is about 335 m. long. Among its principal tributaries are the Grey Bull and Little Big Horn rivers.

BIGNONIACEAE, or TRUMPET-CREEPER FAMILY, a family of woody plants in the order Polemoniales. Most of the plants of the family are tropical, and native to America and Asia. They include trees, shrubs, and vines, most of which bear showy, trumpet-shaped flowers in great numbers. Species of the genera *Bignonia* and *Tecoma* are evergreen vines; species of *Crescentia, Jacaranda* (see JACARANDA WOOD), and *Catalpa* (q.v.) are ornamental trees.

BIGOD, name of an English noble family important in the 12th and 13th centuries. Its prominent members include the following. **1.** HUGH, 1st EARL OF NORFOLK (d. 1176?). He is believed to have obtained his title by his help in making Stephen of Blois the king of England (see STEPHEN, King of England). **2.** ROGER, 2nd EARL OF NORFOLK (d. 1221), son of Hugh and one of the leaders (1215) of the barons who forced John, King of England, to grant the Magna Charta (q.v.). Roger was one of the signatories of that document. **3.** ROGER, 4th EARL OF NORFOLK (d. 1270), grandson of the 2nd Earl. In the struggle for supremacy between Henry III, King of England, and the English barons led by Simon de Montfort, Earl of Leicester, Roger first supported Henry and then became a member of De Montfort's group, which for a time took the control of the government away from the king. **4.** ROGER, 5th EARL OF NORFOLK (1245–1306), nephew of the 4th Earl. He opposed the war which King Edward I of England was about to wage against France in 1297, and was instrumental in forcing the king to confirm various rights the nobility had gained from the kings of England. Roger left no heirs; the title ended with his death, and the estates of the Bigod family reverted to the crown.

BIG SIOUX RIVER, river of South Dakota and Iowa, rising in Grant Co., S.D. It flows generally southward for about 300 m., emptying into the Missouri R. at Sioux City, Iowa. From the N.E. extremity of Lincoln Co., S.D., to Sioux City the river forms the South Dakota-Iowa boundary.

BIG SPRING, county seat of Howard Co., Texas, 268 miles W. of Fort Worth. It lies in an agricultural and petroleum-producing region. Cotton is the principal crop. In the city are oil refineries, a cottonseed-oil mill, and railway shops. Big Spring is the site of a State hospital and a Civil Aeronautics Authority training school. Pop. (1950) 17,286.

BIG TREE, in the U.S., a synonym for sequoia (q.v.).

BIHAR or **BEHAR,** State of the Union of India, adjoining Nepal on the N. and West Bengal on the E. Agriculture is the principal industry of Bihar. Rice, corn, oilseeds, gram (a leguminous plant), barley, wheat, sugar cane, tobacco, fruits and vegetables, cotton, and jute are the chief crops. The State is rich in coal and iron ores, and is the world's greatest source of mica. Patna, the capital; Gaya; and Bhagalpur (qq.v.) are the principal cities. In antiquity most of the region comprising present-day Bihar was occupied by the kingdom of Magadha. The region subsequently formed part of the Maurya Empire and of the Gupta Empire (see INDIA: *History*). Seized by the Moslems in the 12th century A.D., it was held by them until 1497. The British acquired Bihar in 1765 and merged it with Bengal. From 1912 to 1936, when it became a separate province of British India, Bihar formed part of the province of Bihar and Orissa. Area of State, 70,368 sq.m.; pop. (1951) 40,218,916.

BIHAR or **BEHAR,** city of the State of Bihar, Union of India, situated about 40 miles S.E. of Patna. It is a commercial and industrial center, with plants engaged in the manufacture of textiles. A Mohammedan holy city, it contains numerous mosques and sacred tombs. Pop. (1941) 54,551.

BIISK or **BISK,** city of Altai Territory, Soviet Russia, situated at the headwaters of the Ob R., about 80 miles S.E. of Barnaul. The surrounding region has extensive agricultural enterprises, notably dairy and poultry farms. Wheat and flax are leading crops. Biisk is an important river port and headquarters for trade by caravan with Outer Mongolia. Among the chief articles of trade are furs, wool, lump silver, tea, and dairy products. Industries in the city include food processing and textile manufacturing. Pop. (1939) 80,190.

BIJAPUR or **BEJAPUR,** town of Bombay State, Union of India, situated about 240 miles S.E. of Bombay. Textile manufacturing is the principal industry. Formerly one of the most magnificent cities of southern India, present-day Bijapur consists of an inner section, surrounded by a massive wall with a

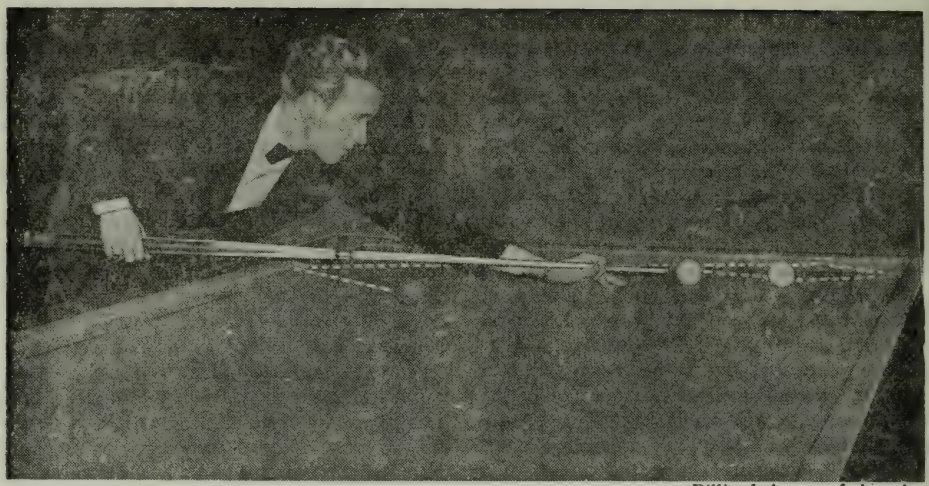
circumference of 6 m., and an outer section containing extensive ruins. The wall ranges from 30 to 50 ft. in height and is of hewn-stone construction. Within the outer section are several splendid edifices in the Islamic architectural style, notably the restored mausoleum Gol Gunbaz, built between 1626 and 1656, and surmounted by a dome nearly 200 ft. high. Among other features of the outer city are remnants of a palace and numerous ruined mosques. The dominant feature of the inner city is a citadel measuring a mile in circumference. One of Bijapur's outstanding historical treasures is *Malik-i-Maidan*, a piece of bronze ordnance cast in 1549. Captured from the armed forces of Ahmednagar in the 17th century, it is reputedly the largest bronze gun in existence. Bijapur's importance dates from 1489, when it became the capital of a Mohammedan kingdom of the same name. Both the town and kingdom flourished for considerably more than a century thereafter. According to some accounts the town contained 100,000 dwellings and 1600 mosques at the height of its prosperity. The kingdom was conquered by the Mogul emperor Aurangzeb in 1686. In the ensuing period of decline the city was ceded (1760) to the Maratha kingdom and annexed (1818) by the British. It was attached to Bombay in 1848. Pop. (1941) 48,968.

BIKANER, former princely state of India, now forming part of Rajasthan Union, Union of India. The Bikaner region is situated in the N. portion of Rajputana and occupies part of the Thar Desert. The terrain consists almost entirely of shifting sand hills. Extreme aridity prevails throughout the region, and agricultural enterprises are dependent on water drawn from deep wells or from irrigation canals extending from the Punjab region. Livestock farming, especially the raising of camels, horses, and sheep, is the principal agricultural industry. Ivory carving, carpet weaving, metalworking, and other handicrafts are leading occupations in the region. Bikaner (q.v.) is the principal town. Prior to the termination (1947) of British paramountcy in India, Bikaner was a member of Rajputana Agency. The state joined the Rajasthan Union on March 30, 1949. Area of former state, 23,181 sq.m.; pop. (1941) 1,292,938.

BIKANER, city of Rajasthan Union, Union of India, situated about 247 miles W. of Delhi. Most of the city lies within a massive, battlemented wall, over 3 m. in circumference and from 15 to 30 ft. high. Noteworthy edifices include a number of Jain monasteries and a strongly fortified citadel. Bikaner is a famous carpet-weaving and blanket-making center. Pottery making and the manufacture of sugar candy are other leading industries. The city was founded in 1485 and was formerly capital of the princely state of the same name. Pop. (1951) 117,113.

BIKINI, atoll of the Marshall Islands, United States Trust Territory of Pacific Islands, situated in the W. Pacific Ocean, about 2000 miles W. of Hawaii. One of the Ratak group, the atoll consists of about 20 islets, with an aggregate area of 2.87 sq.m., and encircles a lagoon 2½ m. long and 11 m. wide. In 1945, following the end of World War II, Bikini was selected by the U.S. government as the site of "Operation Crossroads", a series of tests of the atomic bomb. Oceanographic, geological, and biological surveys were conducted on Bikini early in 1946, and on March 11, 1946, the atoll's population, then consisting of 167 native men, women, and children, were moved to Rongerik Atoll, an uninhabited islet 109 miles to the N.E. The first experimental explosion, designed primarily to determine the effects of an aerial burst on naval vessels, took place on July 1, 1946; the second explosion, designed to determine the effects of a bomb detonated under water, took place on the following July 25. See ATOMIC ENERGY AND ATOMIC BOMB: *Nuclear Explosions*.

BILBAO, capital and seaport of Biscay Province, Spain, situated on both sides of the Nervión R., about 7 m. inland from the Bay of Biscay. The city consists of an old section, lying on the right bank of the Nervión and a modern section, dating from the latter part of the 19th century, on the left bank. Five bridges connect the old and new sections. *Siete Calles* ("Seven Streets"), a district in old Bilbao, is an outstanding example of 14th-century city planning. Bilbao's port facilities include five drydocks, which are accessible to vessels drawing up to 25 ft. of water, and several piers over 6000 ft. in length. Deep-draught vessels load and discharge cargo at an outer harbor located at the mouth of the Nervión. Iron, iron ore, wine, linen, and local manufactures comprise the bulk of exports; the chief imports are coal and timber. Leading industries include iron and steel making, shipbuilding, flour milling, the manufacture of soap and paper, and the brewing and distilling of liquors. Bilbao was founded as *Belvao* ("fine ford") in 1300. By virtue of various privileges granted the town it swiftly became



Billiard Assoc. of America

Every move in a game of three-cushion billiards must be skillfully planned.

one of the leading seaports of Spain. The commercial law of Bilbao, codified in the *Ordenanza de Bilbao* (1737), greatly influenced the commercial law of Spain and its American colonies. During the wars with France (1795 and 1808) the town was severely damaged. It withstood two great sieges by the Carlists (q.v.) in 1835–36 and 1874. During the Spanish Civil War (1936–39) Bilbao was the capital of an autonomous Basque state which was under Loyalist control. Pop. (1950) 235,508.

BILDERDIJK, Willem (1756–1831), Dutch poet and scholar, born in Amsterdam, and educated at the University of Leiden. Bilderdijk practiced law for a time in The Hague, but he refused to take the oath of allegiance to the Batavian Republic established (1795) in Holland by the French during the wars of the French Revolution, and was an exile for eleven years. In 1806 he returned and became state librarian under Louis Bonaparte, King of Holland. Bilderdijk's best-known work is the epic poem *De Ondergang der Eerste Wereld* (1820). Among his other writings are the didactic poem *De Ziekte der Geleerden* (1807) and the historical work *Geschiedenis des Vaderlands* (1832–51).

BILECIK, administrative center of the il of the same name, Turkey in Asia, situated about 165 miles w. of Ankara. Sericulture is an important industry in the il, and the town has several factories engaged in the production of silk fabrics. Area of il, 1826 sq.m.; pop. (1950) 138,844. Pop. of town (1950) 4886.

BILHARZIA DISEASE. See Schistosomiasis.

BILLAUD-VARENNE, Jean Nicolas (1756–1819), French Revolutionist, born in La Rochelle, and educated in law. He became a member of the extreme revolutionary group known as the Jacobins (q.v.). In 1792 he was elected a member of the National Convention of France. He advocated the establishment of a federal republic and the execution of King Louis XVI, and in 1793 led the attack on the moderate group known as the Girondists (q.v.) in the National Convention. In the Jacobin Club he formulated a program, later adopted by the government of the French Revolutionist Maximilien de Robespierre, which included, among other measures, the creation of a revolutionary army and the imposing of taxes on the rich. He became a member of the Committee of Public Safety, the center of governmental power; demanded a redivision of property; and attacked Robespierre as a moderate. Following the overthrow of Robespierre's government in 1794, Billaud-Varenne was arrested, and, in 1795, was deported to Cayenne in French Guiana. In 1816 he went to Port-au-Prince, Haiti, where he died.

BILLIARDS, game played by two or more persons on a rectangular table with hard elastic balls, struck against each other by tapering rods called cues. The origin of the game is obscure. Some historians assert that it was brought to Europe from the East by

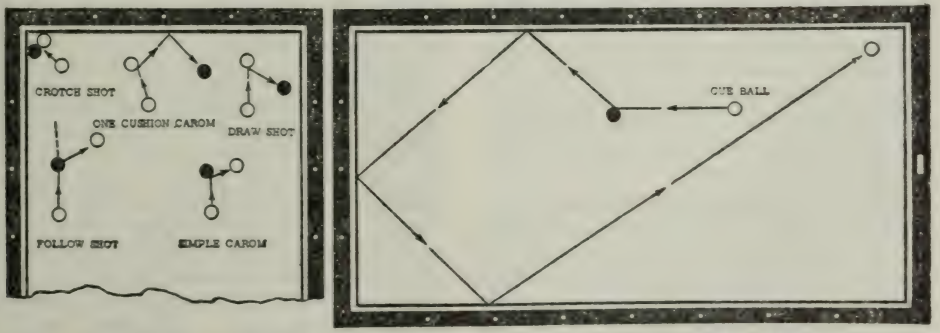
Crusaders during the Middle Ages. Originally an outdoor sport, the game was played on the ground, first with stones and later with balls. Subsequently the game was played indoors, on a table, as a game similar to an indoor version of modern croquet (q.v.), with two balls struck by mallets or sticks through an iron arch. In France, during the reign of King Charles IX, in the 16th century, the design of the table was standardized and uniform rules were introduced. In the 18th century French players elminated the arch and added a third ball, introducing the modern carom game (see below).

The game became popular in the United States after the introduction from France of such technical improvements as leather cue tips in 1823 and shortly thereafter of marble or slate table tops or beds; these features enabled the player to impart to the ball a fast, straight roll. In 1854 rubber cushions along the sides of the table were introduced, permitting a strong, accurately controlled rebound, and from that time billiards rapidly developed into a game of scientific precision.

Although billiard tables vary in size in different countries, the standard or "full size" table in the United States is 5 ft. wide and 10 ft. long, but "half size" tables 4½ ft. wide and 9 ft. long, are more extensively used. The balls are 2⅜ inches in diameter; three balls are used in the popular games. The balls are propelled by a cue, a rod, usually made of wood, which tapers from 1½ inches at the base to ½ inch in diameter at the tip, and weighs from 14 to 22 ounces. The object of the game is to make *caroms*, that is, to propel the cue ball by striking it with the tip of the cue so that the cue ball will hit both of the other balls in turn. The game is scored by points, with each carom counting for a single point. The contestants take alternate turns, and each contestant retires when he fails to make a carom. In tournament play, the winning score is generally 100 points; in nontournament play, however, other winning scores, such as 25 or 33 points, are often agreed upon by the players.

In England the popular game is pocket billiards, played on a table with six pockets. Points are scored in this game by combinations of caroms and pocketing the balls as well as by straight caroms. In the U.S. the pocket table is usually reserved for games of pool (see POCKET BILLIARDS), and billiards is played exclusively as a carom game on a table with continuous cushions. Various hazards are introduced to make the game more difficult and, consequently, of more interest to the expert player. In the balkline game, rectangular areas are marked off on the table by lines chalked either 14 or 18 inches from each cushion; a player may not score more than two successive caroms in the same area unless he drives a ball out of that particular rectangle. In the three-cushion game the cue ball must strike at least three cushions before completing a carom.

The professional championship tournaments in America were dominated for almost half a century by the American billiardists Willie Hoppe, Jacob Schaefer, Jr., and Welker Cochran. The national championship in 18.2 (18 inches-2 caroms) balkline billiards was held by one or another of these players from 1911 to 1935, except for the years 1926 and 1928. About 1933 popular favor turned from the balkline to the three-cushion game, and Hoppe and Cochran entered this field. Except in 1939, when Joe Chamaco won, Hoppe or Cochran held the three-cushion championship every year from 1935 to 1952. In 1953 Ray Kilgore won the title. No official championship matches were played in 1954 or 1955.



Left: Diagrams at one end of a billiard table showing various ways of making caroms.
Right: Cue ball strikes three cushions before completing three-cushion carom.

BILLINGS, county seat of Yellowstone Co., Mont., on the Yellowstone R., about 180 miles E.S.E. of Helena. It lies in the "Midland Empire", an extensive stock-raising region. Served by three railroads, the city is a shipping center for livestock, wool, butter, eggs, sugar, flour, and grain. Its principal industries are the processing of sugar beets, vegetable canning, and the manufacture of flour and of farm machinery. In addition, it has oil refineries, creameries, and meat-packing plants. Billings is the site of Eastern Montana State Normal School and of Billings Polytechnic Institute. Pop. (1950) 31,834.

BILLINGS, JOHN SHAW (1838–1913), American physician and librarian, born in Switzerland Co., Ind., and educated at Miami University and the Medical College of Ohio. During the Civil War he served in the field and in the surgeon general's office, and later became curator of the Army Medical Museum and Library. Under his supervision the Surgeon General's Library became the third most important medical library in the world. In 1896 as director of the Astor, Tilden, and Lenox foundations, he merged these and other free libraries of New York City to found the New York Public Library, and was its chief librarian until his death. His works include *Ventilation and Heating* (1884), *National Medical Dictionary* (1893), *Social Statistics of Cities* (for the 11th U.S. Census), and *Some Library Problems of Tomorrow* (1902).

BILLINGS, WILLIAM (1746–1800), American composer of hymns, born in Boston, Mass., and largely self-trained. Originally a tanner by trade, he subsequently became a teacher of music and choral singing, and introduced into New England a vigorous style of church music. He wrote the texts for many of his tunes and produced the collections of music *The New England Psalm-Singer* or *American Chorister* (1770), *The Singing Master's Assistant* (1778), *Music in Miniature* (1779), and *Psalm-Singer's Amusement* (1781). His anthems include "Except the Lord Build the House" and "The Lord Is Risen from the Dead".

BILLITON, BELITONG, or **BELITOENG,** island of the Malay Archipelago, forming part of the Republic of Indonesia and situated in the Java Sea. About 55 m. long and 43 m. wide, it is generally rectangular in shape and has a diversified terrain, with hilly areas and extensive tracts of marshland. Climatic conditions are typically tropical. Billiton contains rich tin deposits, and tin mining is the chief industry. Tandjoengpandan (pop. in 1930, 15,708), on the N.W. coast, is the principal town. Originally a part of the sultanate of Palembang. Billiton was ceded to the British in 1812. The British recognized Dutch claims to the island in 1824. Prior to the termination (1949) of Dutch paramountcy in Indonesia, Billiton belonged to Bangka Residency, Netherlands Indies. Area, 1866 sq.m.; pop. (1930) 73,429.

BILL OF ATTAINDER. See ATTAINDER, BILL OF.

BILL OF RIGHTS, designation popularly applied to the first ten amendments to the United States Constitution, and the popular designation of declarations of right based on these amendments and prefixed to most of the State constitutions. For the history of the Federal Bill of Rights, and its text, see the article in this encyclopedia entitled CONSTITUTION OF THE UNITED STATES.

The phrase "bill of rights" was originally a popular designation for an act of the British Parliament in 1689, which, after the abdication of King James II, condemned his unconstitutional practices, and restated principles of civil rights and political liberty. The British act provided, among other things, that Parliament was to be elected freely and was to meet frequently; that members of Parliament were immune from civil and criminal proceedings in the courts in connection with their utterances in Parliament; that the Crown could not maintain a standing army in peacetime, impose taxes, or suspend or execute the laws without the consent of Parliament; that British subjects had the right to petition the Crown; that excessive bail and fines and unusual punishments were prohibited; that juries were to be impartially chosen; and that penalties imposed before conviction were illegal. See also DECLARATION OF THE RIGHTS OF MAN.

BILLROTH, ALBERT CHRISTIAN THEODOR (1829–94), German physician, born in Bergen (Rügen), and educated at the universities of Göttingen, Berlin, and Vienna. He was appointed professor of surgery at the universities of Zürich (1859) and Vienna (1867). Billroth was one of the great surgeons of his day, and was known for his many innovations in surgical techniques and for his contributions to military medicine. His writings include *Die Allgemeine Chirurgische Pathologie und Therapie* (1863), *Chirurgische Briefe aus den Kriegslazaretten in Weissenburg und*

Mannheim (1872), and *Ueber den Transport der im Felde Verwundeten und Kranken* (1874).

BILLY THE KID, real name WILLIAM H. BONNEY (1859–81), American desperado, born in New York City. As a youth he lived in Kansas, Colorado, and New Mexico, and soon became notorious as an outlaw, perhaps the most notorious in the history of the southwestern United States. Though Bonney was actually a ruthless robber and killer, romantic legends have been associated with his personality and his lawless exploits.

BILNEY, THOMAS (1495?–1531), English martyr, born probably in Norwich. He denounced saint and relic worship, and converted the English religious reformer Hugh Latimer and many others to his Protestant viewpoint. Bilney was arraigned before Cardinal Thomas Wolsey in 1527, recanted, and was absolved, but was confined in the Tower of London until 1529. In 1531 he began again preaching his views in Norfolk, but was soon arraigned, condemned as a heretic, and burned at the stake.

BILOXI, city of Harrison Co., Miss., on a peninsula formed by Back Bay of Biloxi and the Gulf of Mexico, about 13 miles E. of Gulfport. Outlying islands and the Harrison County seawall, one of the largest and longest of its kind, protect Biloxi on the seaward side. The city is a summer and winter resort, and is one of the largest seafood centers in the United States, with extensive shrimp, oyster, fish, and crab-meat canneries. Other industries include shipbuilding, bottling, and the manufacture of storage batteries. Biloxi is the site of Keesler Air Force Base, with the U.S. Air Force Technical School and Electronics Center, and of a Veterans Administration Center. Historical points of interest include Beauvoir, the last home of President Jefferson Davis of the Southern Confederacy; Biloxi Lighthouse; and Fort Massachusetts on nearby Ship Island. Biloxi was founded by the French in 1699, and on three occasions was the capital of the vast French province of Louisiana. Pop. (1950) 37,425.

BIMELER or **BÄUMELER,** JOSEPH (1778–1853), German-American religious leader, born in Württemberg. He became a member of a sect called the Separatists which, to escape religious persecution, emigrated to the United States. In 1817 the Separatists established a community at Zoar, Ohio. Bimeler arranged for the purchase of the land, and after the establishment of the community was elected its spiritual and temporal leader. See ZOAR, SEPARATIST SOCIETY OF.

BIMETALLISM, a monetary policy based on the use of two metals, usually gold and silver, as legal tender, coined without limit ("free coinage"), and equalized by law in a fixed ratio. The ratio is expressed in terms of weight, usually with a fixed number of ounces of silver being made equal to one ounce of gold. Determined by law, this ratio does not necessarily reflect the relative abundance of the metals, and therefore may be changed by law, as in the United States, in 1834, when the former ratio of 15 to 1 was changed to 15.988 to 1 or, as commonly expressed, 16 to 1. The ratio has no relation to the commercial ratio (value) of the metals, which may fluctuate. Adherents of bimetallism maintain that the fixed legal ratio prevents nearly all fluctuations in the commercial values of the two metals and hence tends to stabilize the prices of commodities and to simplify foreign exchange. Most economists, however, are opposed to bimetallism, on the ground that the cheaper metal, i.e., that which is valued commercially at less than its face value, drives the dearer from circulation, and that the dearer, valued by weight, tends to be used as metal and withdrawn from coinage. See GRESHAM'S LAW.

Practical difficulties in the maintenance of a concurrent circulation of the two metals have led one nation after another to adopt a system of monometallism, with gold as its basis. In England the single gold standard, actually in operation since 1699, was finally legalized by successive steps, in 1717, 1774, 1798, and 1816. The United States adopted the double standard, as urged by the statesman Alexander Hamilton and Thomas Jefferson, in 1792. France, in 1801, instituted a plan to make a five-franc silver piece standard money, and during the early part of the century silver was the usual currency of the country. But after the discovery of gold in Australia and California and the fall in the price of gold relative to silver, the French law favored the coinage of gold. In 1871 Germany, formerly upon a silver basis, adopted the gold standard as one of the elements of the unification of the coinage following the establishment of the empire. Thereafter the most important European nations, including France, Belgium, Switzerland, and other members of the Latin Union, abandoned the double standard for the single gold standard. Bimetallism was abandoned in the United States

in 1873. The Bland-Allison Act of 1878, however, allowed a limited number of silver dollars to be coined, thus creating the system termed "limping bimetallism", a monetary system partially dependent on the use of silver, but primarily on that of gold. Bimetallism was a major political issue in France and other European nations. In the United States during the last quarter of the 19th century, a period characterized by steadily falling prices and a commercial depression, it also became a crucial political issue. The policy of "limping bimetallism" was ended by the Gold Standard Act of 1900, and with the gradual improvement in the economic conditions in the United States the issue was forgotten. It was revived, however, in the 1930's, following the depression of 1929, and although true bimetallism was not established, silver was added to gold as the monetary base of the United States.

See also GREENBACK PARTY; MONEY; PEOPLE'S PARTY; SILVER.

BINARY STARS. See DOUBLE STARS.

BINDER, ABRAHAM WOLFE (1895–), American musician, born in New York City, and educated at Columbia University. In 1918 he became director of music for the Young Men's and Young Women's Hebrew associations; after 1922 he taught liturgical music at the Jewish Institute of Religion, New York City. He became director of music of the Free Synagogue, New York City, in 1923, and lecturer at Hebrew Union School of Sacred Music, of which he was a founder, in 1948. Binder was an authority on all phases of Jewish music. Among his compositions are the orchestral overture *He-Chalutsim* (1930); the orchestral suite *Holy Land Impressions* (1932); the orchestral work *Lament—in Memory of the Defenders of the Warsaw Ghetto* (1944); *Concertino for String Orchestra* (1945); *Israel Reborn* (1948) and the requiem *Yizkor* (1950), both for chorus and orchestra; liturgical services; chamber music; piano pieces; songs; and choral arrangements of American and Hebrew folk songs.

BINDRABAN. See BRINDABAN.

BINDWEED. See CONVOLVULUS.

BINET, ALFRED (1857–1911), French psychologist, born in Nice, and educated at the Sorbonne, Paris. In 1894 he became director of the laboratory of physiological psychology at the Sorbonne. He was one of the leading psychologists of his time, and is known for his development of the intelligence tests which are still the basis for testing the mental ability of children; see PSYCHOLOGICAL TESTING. Binet was one of the founders and editors of *L'Année Psychologique*, an annual, first published in 1895. Among his works are *Recherches Expérimentales par l'Hypnotisme* (1886), *Étude Expérimentale de l'Intelligence* (1903), *L'Âme et le Corps* (1905), and *Les Révélations de l'Écriture d'après un Contrôle Scientifique* (1906).

BINGEN, city of Rhineland-Palatinate, West Germany, at the junction of the Rhine and Nahe rivers, about 18 miles w. of Mainz. It is a tourist center and an industrial and commercial community, with plants engaged in liquor production and the manufacture of leather, tobacco products, and starch. Grain, livestock, wine, coal, and iron are the chief articles of trade. Points of interest in Bingen include the *Drususbrücke*, a bridge (spanning the Nahe R.) built in 13 B.C. by Roman troops under General Drusus Germanicus, a 15th-century Gothic church, and the Rhenish Technical College. In the vicinity are the *Bingerloch*, a famous whirlpool in the Rhine R.; the *Mäuseturm* (Mouse Tower), in which, according to legend, the German prelate Hatto II was devoured by mice in 969 or 970; and the ruins of a medieval castle. Prior to the arrival of the Romans Bingen was a town of the Belgæ. The Romans fortified the town, and there in 70 A.D. they inflicted a severe defeat on the Gauls. In 1254 it became a member of the Hanseatic League. Considerable fighting took place in and around Bingen during the Thirty Years' War, and in 1689 it was burned by the French. From 1797 to 1814, during the Napoleonic Wars, the French ruled the town. By decision of the Congress of Vienna (1815), which drafted the peace treaty ending the Napoleonic Wars, Bingen was included in the grand duchy of Hesse-Darmstadt (q.v.). Pop. (1946) 15,373.

BINGHAM, HIRAM (1875–1956), American educator, explorer, and political leader, born in Honolulu, and educated at Yale and Harvard universities, and at the University of California. In 1909, after two years on the faculty of Princeton University, he was appointed assistant professor of Latin-American history at Yale. As director of the Yale Peruvian Expedition (1911), he discovered the ruins of the ancient Incan city of Machu Picchu, located Vitcos, the last capital of the Incas, and made the first ascent of the Andean peak Nevado Coropuna (21,720 ft.). He was made professor of Latin-American history at Yale in 1914. In 1917, after the United States entered World War I, he was commissioned

major in the Aviation Section of the Signal Corps and placed in charge of the U.S. schools of military aeronautics. His subsequent service included command (1918) of the Issoudun (France) Aviation Instruction Center, the largest flying school maintained by the Allies. A prominent member of the Republican Party, Bingham served as lieutenant governor of Connecticut from 1923 to 1924, and was then elected governor, but he resigned shortly after his inauguration to become U.S. senator. He served in the Senate until 1933. In 1942–43, during World War II, he lectured at U.S. naval training schools. From 1951 to 1953 he was chairman of the Loyalty Review Board of the Civil Service Commission. Among his works are *Across South America* (1911); *An Explorer in the Air Service* (1920); *Inca Land* (1922); *Freedom under the Constitution* (1924); *Machu Picchu* (1930); *Elihu Yale, Governor, Collector and Benefactor* (1938); and *Elihu Yale: The American Nabob of Queen Square* (1939).

BINGHAM, Joseph (1668–1723), English scholar and divine, born in Wakefield, and educated at University College, Oxford University. Accused of heresy, he was obliged to resign a fellowship at University College. Bingham is known for his great work *Origines Ecclesiasticæ*, or *Antiquities of the Christian Church* (10 vols., 1708–22).

BINGHAM, Walter Van Dyke (1880–1952), American psychologist, born in Swan Lake, Iowa, and educated at Beloit College, Harvard University, and the universities of Chicago and Berlin. After teaching psychology at various universities, he was professor of psychology at the Carnegie Institute of Technology from 1915 to 1924, and at the Stevens Institute of Technology from 1930 to 1940. During World War I he originated the army classification system, and in World War II he served as chief psychologist in the personnel classifications branch of the adjutant-general's office in the War Department. He is the author of *Aptitudes and Aptitude Testing* (1937), and coauthor of *How to Interview* (1931) and *Psychology Today* (1932).

BINGHAMTON, county seat of Broome Co., N.Y., at the confluence of the Susquehana and Chenango rivers, about 120 miles s.w. of Albany. It is served by several railroads, and is the northern terminus of the Lackawanna Trail highway. An airport, known as the Tri-Cities Airport, is operated in conjunction with nearby Endicott and Johnson City. Industries in Binghamton are the manufacture of photographic supplies, shoes, furniture, clothing, and automobile parts. The city was settled about 1787 as Chenango Point; it acquired its present name about 1820. In 1834 Binghamton was incorporated as a village, and in 1867 it became a city. Pop. (1950) 80,674.

BINGÖL, il of Turkey, situated in E. central Turkey in Asia. Its products are chiefly agricultural and pastoral. Bingöl (pop., about 300) is the capital. Area, 1007 sq.m.; pop. (1950) 97,225.

BINOMIAL, an algebraic expression consisting of two terms, separated by + or —, such as $x+y$, $ab—cd$. The binomial theorem is a method of expanding $(x+y)^n$ into a series of powers of x and y, thus:

$$(x+y)^n = x^n + nx^{n-1}y + \frac{n(n-1)}{1.2}x^{n-2}y^2 + \frac{n(n-1)(n-2)}{1.2.3}x^{n-3}y^3 + \ldots .$$

The expansion has n+1 terms, of which the last term is y^n. The binomial theorem was discovered by the English scientist Isaac Newton about 1666. It is useful in many branches of mathematics, particularly in the theory of probability (q.v.).

BINTAN or **BINTANG,** largest island of Riouw Archipelago, situated S.E. of Singapore in the South China Sea, and forming part of the Republic of Indonesia. Bauxite mining is the principal industry. The chief town is Tandjoengpinang (pop. in 1930, 5789), on the S.W. coast. Area, 415 sq.m.; pop., about 20,000.

BINUE. See Benue.

BINYON, Laurence (1869–1943), English poet, art critic, and playwright, born in Lancaster, and educated at Trinity College, Oxford University. From 1893 to 1933 Binyon was an official of the British Museum, and during much of this period was in charge of the museum's collection of Oriental prints and drawings. He established a reputation as an authority on art history, particularly of the Orient, and was also known as a lyric poet and verse dramatist. Binyon wrote many books on Chinese, Japanese, and Indian art, including *The Flight of the Dragon* (1911) and *Court Painters of The Grand Moguls* (1921). His plays include *Sakuntala* (1920) and *Boadicea* (1925). Among his many volumes of verse are *Lyric Poems* (1894) and *The Idols* (1928).

BÍO-BÍO, inland province of S. Chile, west of the Argentine border. Mountainous and heavily forested, the province yields a large

amount of timber. The capital is Los Angeles (pop., about 21,000). Area of province, 4343 sq.m.; pop. (1952) 137,783.

BIOCHEMISTRY. See CHEMISTRY, PHYSIOLOGICAL.

BIOGENESIS, theory that all living matter originated from similar pre-existing organisms or parents. The hypothesis is opposed to the concept of spontaneous generation (q.v.), known also as abiogenesis. Biogenesis has been widely accepted by scientists for almost a century. Recent scientific developments indicate that the theory may have to be modified to include such ultramicroscopic phenomena as the virus (q.v).

BIOGENETIC LAW or **RECAPITULATION THEORY,** principle that the embryological development of the individual organism recapitulates the evolution of the race or group. Formulated in 1867 by the German biologist Ernst Haeckel, the law was interpreted originally to mean that, in its development, the embryo passes through exactly the same stages as did the race in its evolution. In present-day biology the principle is no longer considered to apply strictly; the development of the embryo is regarded by contemporary biologists as a condensed or superficial recapitulation of the development of the race.

BIOGRAPHY, the life history of an individual written by another person. It is distinguished from an autobiography, which is a person's life history written by himself.

The earliest biographical records are contained in cuneiform inscriptions recounting the lives and exploits of the great rulers of antiquity. The Old Testament contains written accounts of the lives of the patriarchs, and in the New Testament, the Gospels According to Matthew, Mark, Luke, and John portray the life of Jesus Christ.

Other early biographical works include *Memorabila* (4th century B.C.), an account of the life of the Greek philosopher Socrates by the Greek author Xenophon; *Parallel Lives* (1st century A.D.), by the Greek biographer Plutarch; *Life of Agricola* (97 or 98), by the Roman historian Tacitus; and *Lives of the Sophists* (3rd century A.D.), by the Roman philosopher Flavius Philostratus. The subject matter of medieval biography was foreshadowed in *Lives of the Fathers* (4th–5th centuries), by Saint Jerome; during the following centuries, biography consisted essentially of records of the lives of martyrs, saints, and churchmen.

Later biographical works include *Delle Vite de' Più Eccelenti Pittori, Scultori, ed Architettori* (1550), by the Italian architect and painter Giorgio Vasari, comprising the chief source of information on the lives of Italian Renaissance artists; *Bibliotheca Universalis* (1545–49), by the Swiss naturalist Konrad von Gesner, probably the first biographical dictionary ever published; the life of the English prelate and statesman Thomas Wolsey by the English courtier and author George Cavendish (1500–62?), written in 1557 and circulated in manuscript form until its publication in 1641 under the title *The Negotiations of Thomas Wolsey*; *Life of Samuel Johnson LL.D.* (1791), by the Scottish lawyer and writer James Boswell, regarded by many critics as the finest biography in English literature; *Life of Sir Walter Scott* (7 vols., 1837–38), by the Scottish editor and writer John Gibson Lockhart; and the *British Dictionary of National Biography* (63 vols., 1885–1900), edited until 1891 by Leslie Stephen, and continued to the present.

The earliest biographical writings produced in North America date from colonial times, and include *Magnalia Christi Americana* (1702), by the American clergyman Cotton Mather. Among later works are *American Biography* (2 vols., 1794–98), by the American clergyman and historian Jeremy Belknap; *Life of Washington* (5 vols., 1855–59), by the American author Washington Irving; *Abraham Lincoln, A History* (10 vols., 1890), by Lincoln's former secretaries John Hay and John Nicolay; *Dictionary of American Biography* (20 vols., 1928–37), edited until 1931 by Allen Johnson, and thereafter by Dumas Malone; and *Abraham Lincoln* (6 vols., 1926–39), by the American poet and biographer Carl Sandburg.

BIOLOGICAL CHEMISTRY. See CHEMISTRY, PHYSIOLOGICAL.

BIOLOGICAL SURVEY, originally a bureau in the U.S. Department of Agriculture with the function of classifying, conserving, and controlling all wild vertebrate life of the country except fishes. It was later transferred to the Department of the Interior and, in 1940, merged with the Bureau of Fisheries to form the Fish and Wildlife Service (q.v.).

BIOLOGICAL WARFARE, use of disease-producing agents in warfare, against personnel and food supply. Among the diseases adaptable for such use are pneumonic plague, influenza, measles, mumps, psittacosis, glanders, tularemia, undulant fever, dengue, relapsing fever, and the rickettsial diseases. Some of these diseases have the advantage of prostrat-

ing, rather than killing, enemy troops, so that they become a military liability. Herbicides, plant diseases, and diseases of livestock can be used to reduce the enemy's food supply. During World War II more than $50,000,000 was spent in the U.S. for biological-warfare experiments. More than 3000 scientists were employed in the development of new offensive and defensive weapons, none of which were put to actual military use. The chief offensive biological weapon developed was the toxin of the diseases called botulism (q.v.). This toxin was isolated in pure, crystalline form, and methods were developed for producing it on a large scale. Among the beneficial results of the research were the production of a toxoid to produce immunity to botulism, vaccines for fowl plague and cattle plague, and the discovery of various plant hormones and weed killers.

BIOLOGY, the comprehensive science dealing with living beings. It includes botany and zoology, and all their component sciences. The name was first used in 1801 by the French naturalist Jean Baptiste Lamarck for that study of living material, which differs from botany and zoology in giving more attention to the general laws of life, such as the laws relating to reproduction, growth, and relationship to environment, than to details of form, function, and classification. This branch of science assumed special importance after 1859, when the evolution hypothesis of the English naturalist Charles Darwin furnished an explanation of the resemblances in structure and activity of all living beings. Intensive investigation in the anatomical, physiological, and other aspects of living organisms has resulted in the formation of many specialized branches of both botany and zoology, each with the status of a distinct science. Inasmuch as chemical and physical reactions accompany all life processes, chemists and physicists have been called on to develop biochemistry (see CHEMISTRY, PHYSIOLOGICAL) and biophysics (q.v.) as aids to further analysis of vital processes. See ANTHROPOLOGY; BOTANY; CELL; ECOLOGY; EMBRYOLOGY; EVOLUTION; FERTILIZATION; HEREDITY; METABOLISM; REPRODUCTION; ZOOLOGY.

BION (fl. 3rd or 2nd cent. B.C.), Greek bucolic poet, born near Smyrna. He was a younger contemporary and imitator of the Greek poet Theocritus. Among his extant works are seventeen short poems and the longer *Lament for Adonis.* The latter work was the model for *Adonais,* an elegy by the English poet Percy Bysshe Shelley.

BIONOMICS. See ECOLOGY.

BIOPHYSICS, the science which applies the techniques and knowledge of physics to the study of biological phenomena. The first great work in this field was *De Motu Animalium* ("On Motions of Animals") by the Italian scientist Giovanni Borelli. In this book, published shortly after his death in 1679, Borelli applied the principle of the lever and other laws of mechanics to the motions of bones and muscles. In 1733 Stephen Hales, an English clergyman, made known his experiments on the measurement of blood pressure in veins and arteries, and discussed the factors affecting the volume and speed of blood circulation. However, the full development of biophysics was inhibited until the 19th century by the theory that the laws of the physical sciences were not always applicable to living organisms.

A typical problem studied by biophysicists is that of sensation, the transformation by a sensory organ of a physical impulse such as light, sound, or heat, into a nerve impulse, which is then transformed by the brain into a percept. Modern biophysics has been particularly concerned with the mechanism of nerve transmission and with the velocity of transmission of impulses by nerves.

Recently biophysicists have used radioactive materials as "tracer elements" in biological experiments. Small amounts of a radioactive element are fed to or injected into an experimental organism, and the passage of this material through the body is traced by physical methods. See TRACERS.

BIOPSY, the microscopic examination of tissue removed from a living person, for diagnosis of disease. Biopsy finds its greatest use in early detection of cancer. In advanced cases, biopsy is also used to determine the type and, consequently, the method of treatment of the cancer, and to reveal the effects of treatment. It is used also in diagnosing other diseases, such as leprosy and tuberculosis, and in determining the cause of chronic infections.

BIOT, ÉDOUARD CONSTANT (1803–50), French Orientalist, born in Paris, and largely self-educated. Biot is best known for his researches into the history of the social organization of the Chinese Empire. In 1847 he was elected a member of the French Academy. Among his works are *Dictionnaire de l'Empire Chinois* (1842) and a number of scholarly studies on Chinese culture and history.

BIOT, JEAN BAPTISTE (1774–1862), French physicist and astronomer, born in Paris. He became professor of physics at the Collège de

France in 1800, and was elected to membership in the French Institute at the age of twenty-nine. With the French astronomer Dominique Arago, Biot was appointed to the Bureau of Longitudes, and in 1806 was sent to Spain to supervise the triangulation involved in the measuring of an arc of meridian, preparatory to the introduction of the metric system of weights and measures. Together with Arago he also determined with great accuracy the force of gravity in Paris. Biot was able to demonstrate by direct experiment that the velocity of sound in solids is greater than that in air, and was the first to use the polariscope in determining the nature and amount of sugars in solution. In 1804, with the French scientist Joseph Louis Gay Lussac, Biot made a balloon ascent, the first ascent for the purpose of scientific observations. Among his writings are *Traité Élémentaire d'Astronomie Physique* (3 vols., 1805), *Traité de Physique* (4 vols., 1816), and *Recueil d'Observations Géodésiques* (1821).

BIOTIN, also called vitamin H or coenzyme R, a complex organic chemical, $C_{10}H_{16}O_3N_2S$, with m.p. 231° C. (448° F.), widely distributed in plants and present in most animal tissues. Yeast, liver, and egg yolk are particularly rich sources of this vitamin. Biotin is necessary for good health in animals and man. Its exact action in the body has not yet been explained, but it is connected with the metabolism of the body cells, especially those in the skin and fatty tissues. Synthetic biotin was first prepared in 1943. See VITAMIN: *Biotin.*

BIRCH, common name for deciduous, hardy trees of the genus *Betula* in the family Betulaceae, native to the temperate regions of the Northern Hemisphere. Most of the thirty-five species grow wild in cool woods and mountains, and many are cultivated as ornamental trees. The bark, dark in young saplings, varies from white through orange to black in older trees, depending on the species. Foliage is usually light and thin, and the leaves triangular. Blossoms are borne in separate male and female catkins, and the seeds in small cones. Most species of birch yield a hard, tough, close-grained wood, and the bark separates readily into thin, papery layers.

U.S. Forest Service

White birch trees lining a country road

B. lenta, the black, sweet, or cherry birch, is a forest tree with dark bark which yields a volatile oil similar to oil of wintergreen. The yellow birch, *B. lutea,* grows in damp woods; its constantly peeling bark gives it a shaggy, silvery appearance. *B. alba,* with many varieties, is the white birch, and *B. papyrifera* is the paper or canoe birch; their bark has been used as paper and for making canoes. It may be easily peeled from the tree; it never regenerates, and in its stead a black scar is formed. From this bark, by distillation, is obtained birch oil or birch tar, used in treating certain skin diseases, and in dressing Russian leather.

BIRCH, THOMAS (1779–1851), American artist, born in London, England. He emigrated to the United States in 1793 and settled in Philadelphia, Pa., where he began portrait painting. Birch is best known for his marine views, and for a series of historical scenes of the naval victories of the U.S., painted during the War of 1812. The most important work of the latter group is "Engagement of the Constitution and the Guerrière" (U.S. Naval Academy, Annapolis, Md.).

BIRD, a warm-blooded vertebrate animal, clothed with feathers and normally capable of flight. Birds comprise the class *Aves.* They have existed since early Mesozoic times and dwell in every part of the globe; they are exceedingly diverse in size, form, habits, and appearance, and are adapted to every sort of climate and food. In most cases they are beautiful in form and color and possessed of melodious voices.

Birds are in some ways the most highly developed of vertebrate animals. Their skeleton is more modified from the general type than that of mammals. Their means for locomotion, breathing, and nutrition are not less perfect than those of mammals, and their body temperature, higher than that of any other animals, is an index to the intense activity of their general life.

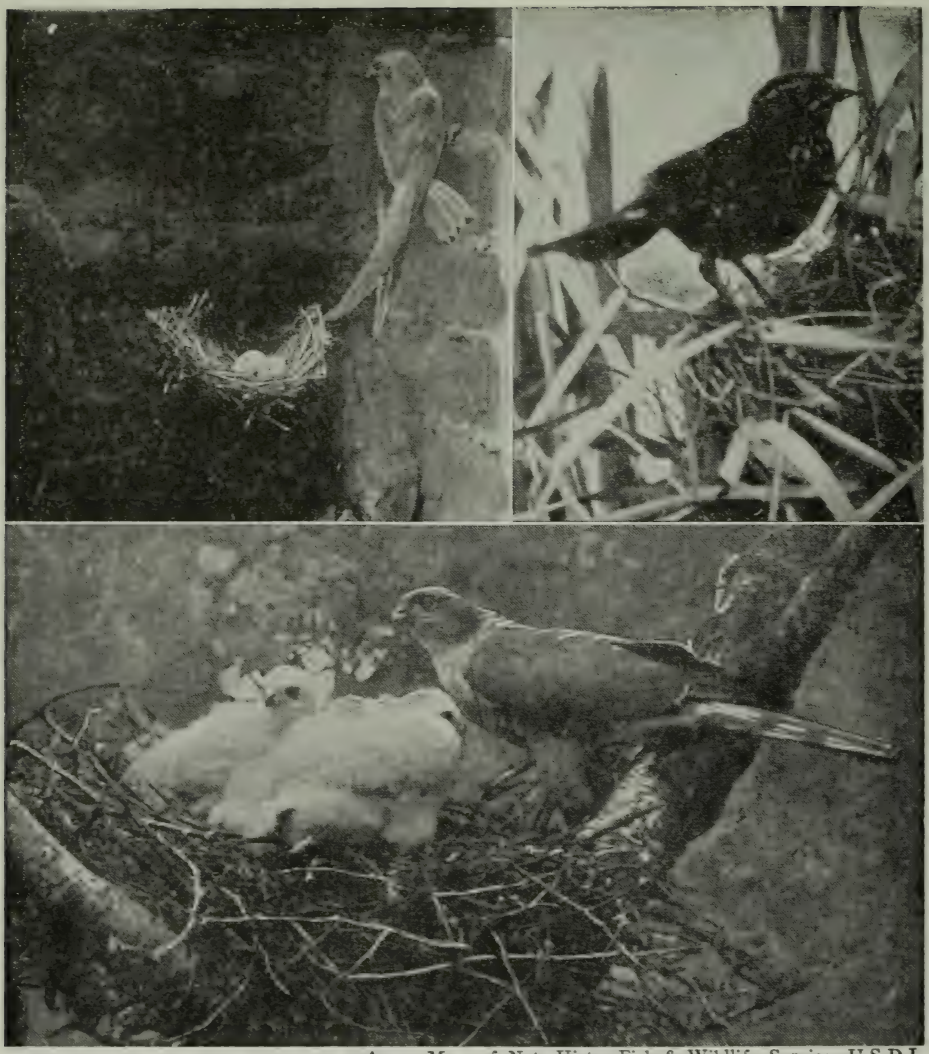
In the history of birds, there has rarely been

Young missel thrushes of England

any difficulty about defining the class. In the 4th century B.C., the Greek philosopher Aristotle defined the birds as feathered, flying bipeds which lay eggs, and catalogued a list, divided into three great orders, with the ostrich and a few others in separate subdivisions. He did not include bats in his list. In the classification inaugurated by the English naturalist John Ray, and perfected by the Swedish botanist Carolus Linnæus, birds received a full share of attention, but the numerous naturalists who, toward the end of the 18th century, tried to put the birds in order, have left in their systems a record of the difficulty of a task which is still acknowledged to be bewildering. Then followed the Cuvierian school of anatomists, and to the French naturalist Georges Cuvier and his disciples much of the present knowledge of bird anatomy is due. The present system of classification was developed only at the end of the 19th century.

STRUCTURE. The anatomical features of birds include the great length of the neck, the inconspicuousness of the forelimbs when at rest, the length of the hind limbs, the shortness of the tail, the boatlike form of the main body, and the smooth gracefulness of the contour curves. As to the appendages, the modification of the forelimbs for flight in the great majority of birds is the most marked characteristic. The bird has never more than three fingers and four toes. The integument differs markedly from that of other animals in being clad with feathers (q.v.). Three distinct kinds of feathers are distinguished: the small, hairlike, downy, rudimentary *filoplumes*; the numerous smaller contour or covering *plumes*; and the large, strong quill feathers or *pennae* on wings and tail. Horny structures form the bill and claws, and the legs of many birds are covered with horny scales, instead of feathers.

SKELETON. The most important peculiarities of the bird skeleton are the modifications of forelimbs and girdle in association with flight, the abundant air cavities, which make the bones light and spongy, and the tendency of the bones to fuse together. The *backbone* is different from that of other animals. The individual backbone bodies (vertebrae) have a complex shape. The neck of mammals most often consists of seven vertebrae, whereas that of birds include a larger and variable number, being more than twenty in the swan. Unlike the very movable neck, the dorsal region tends to become rigid, especially behind, where a large number of vertebrae enter into



Amer. Mus. of Nat. Hist.; Fish & Wildlife Service, U.S.D.I.

BIRDS AND THEIR NESTS. *Top, left: Chimney swift. Right: Red-winged blackbird. Bottom: Female sparrow hawk standing watch over its young.*

immovable connection with the pelvic girdle. The most anterior ribs are fused to the vertebrae, followed by a few which are free, but do not reach the breastbone. The next set meet at an angle. The last ribs are again free. The *skull* corresponds in general structure to that of other vertebrates, but is disinguished by the early fusion of the component bones, by the prolongation of the front bones to bear the bill, by the absence of teeth, by the large sockets for the eyes separated from one another only by a thin partition, and by the marked lightness of the bones. It is on the relations of certain bones of the skull that much of the modern anatomical classification is based.

The shoulder girdle consists (1) of a long bone running backward (the shoulder blade or *scapula*), (2) of a shorter bone running from the shoulder down to the breastbone (the *coracoid*, only a process of the *scapula* in mammals), and (3) of a slender collarbone (*clavicle*) which extends from the shoulder to meet the other clavicle in front of the breast,

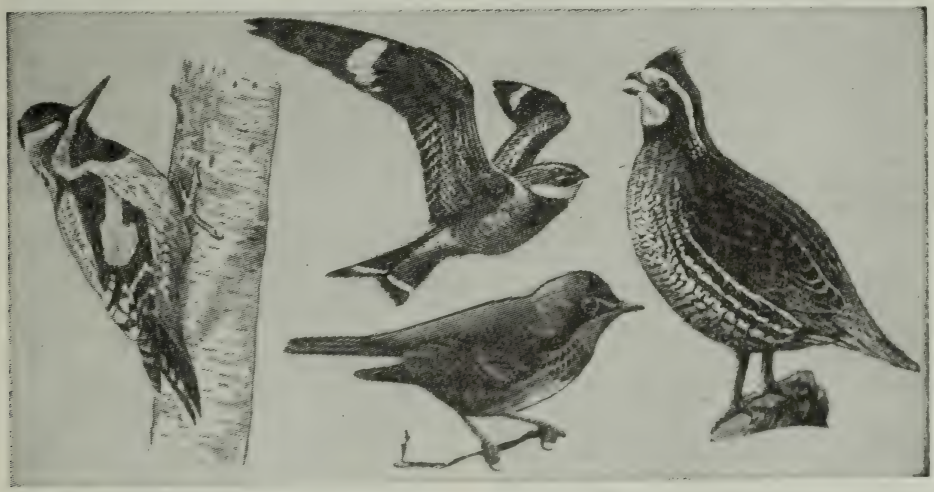
forming a broad uniting plate, the wishbone. The breastbone or *sternum* forms the base of attachment for the great muscles which work the wings; it is concave internally, and in most birds bears a prominent ridge or keel on the midline in front. The wing consists of a strong upper bone or *humerus*, working in the socket formed by scapula and coracoid; of two bones forming the forearm, the *radius* and the stronger *ulna*; of two wristbones, of the three *metacarpals* fused together, and of three fingers. The feathers attached to the hand are usually called primaries, and those borne on the ulna, secondaries. The pelvic girdle is long, and its most important part consists of two dorsal bones (*ilia*), which are fused to a large number of posterior vertebral bodies. A second portion (*ischium*) extends backward on either side, nearly parallel to the hind part of the ilium, with which it is firmly fused. The third part (*pubis*) also runs backward from the socket of the thigh, and is a slender bone. The thigh bone (*femur*) is a short, stout bone. It is followed by the two bones of the lower leg, one of which (the *fibula*) is always imperfect and fused to the strong *tibia*. The knee usually includes a kneecap or *patella*. A bony spur ensheathed with horn is sometimes developed in connection with the metatarsus.

Muscular System. The most important muscles of the bird are those which work the wings. These lie on the breastbone, which forms their base of attachment. The great pectoral muscle, which forms the greater part of the breast, *depresses* the wing. A second smaller and deeper muscle, covered by the former, is continued into a long tendon which passes through a hole at the shoulder joint, is attached to the back of the upper arm, and *raises* the wing. A third and much smaller breast muscle also assists in elevating the wing.

Nervous System. The brain of birds is more developed than that of reptiles. The convolutions characteristic of the forebrain of mammals are not yet developed. The 'tween-brain (*optic thalami*) is hidden, the midbrain (*optic lobes*) bulges outward to either side, and the hindbrain (*cerebellum*) is highly developed. Twelve pairs of nerves arise from the brain.

Sense Organs. The eyes are powerful, and can be rapidly accommodated to different distances. A transparent eyelid or nicitating membrane is conspicuously developed, and can be drawn like a screen across the eye. The ear differs markedly from that of mammals by the absence of any external portion. The external opening is usually surrounded by a circle of fine, hairlike feathers. Only one ear bone (the *columella*) is present, and in this particular also the bird ear differs from that of mammals. Taste and smell are less developed than sight and hearing.

Alimentary System. The character of the food canal differs widely in different birds. The



STRUCTURE IN BIRDS IS CLOSELY RELATED TO FEEDING AND LOCOMOTIVE HABITS

Left: Yellow-bellied sapsucker bores into trees with its sharp bill. Middle, top: Nighthawk catches its insect food on the wing. Middle, bottom: Canada warbler flits lightly from twig to twig. Right: Bob-white has strong legs for swift ground-running.

SHORE AND WATER BIRDS. *Left, top: The black-bellied plover frequents sand bars. Left, bottom: The gannet gets its food by diving into the sea, often from great heights. Right: The great blue heron is a familiar sight standing in pools and streams.*

bill may be helped by the tongue in taking up food, but inasmuch as there are no teeth, no real mastication takes place. Salivary glands open into the mouth cavity. In many birds the gullet dilates into a spacious, thin-walled sack, known as the crop, in which large quantities of food can be retained. In most birds the succeeding portion of the canal is divided into two distinct parts. Soft, glandular walls form the first part; the second part, or *gizzard*, is characterized by thick, muscular walls, and usually contains a number of small stones swallowed to assist in the grinding of the food. The gizzard opens into the intestines, and these end in a common chamber (*cloaca*), which also receives urinary and genital products, and discharges to the exterior.

Vascular System. The heart of birds shows an advance over that of reptiles, in the separation of arterial and venous blood; this separation is almost complete in the crocodilians. Like that of mammals, the heart of the bird is four-chambered. The blood-vessel arrangements also resemble those of mammals in the presence of a single main branch (*aortic arch*) conveying blood from the heart to the body, but running to the right instead of to the left.

Respiratory System. The two lungs do not lie freely in a closed space, as in mammals, but are fixed to the back of the body cavity. Surrounding the lungs are a number of thin-walled *air sacs*, connected to the bronchi and to the air spaces in the bones, and serving as auxiliary organs of respiration. The windpipe (*trachea*) is often long and coiled, and is strengthened by cartilaginous rings. At its upper end the trachea opens into the pharynx through the larynx, and at its lower end it opens into the two bronchi through the *syrinx* (q.v.), containing the vocal apparatus.

Excretory System. The principal organs of excretion are two three-lobed kidneys lying one on each side of the backbone in the pelvic region. They are connected by a pair of ducts (*ureters*) with the cloaca. There is no urinary bladder. The urinary secretion is semisolid, high in uric acid content.

Reproductive System. The male reproductive organs (*testes*) are paired, and lie in front of the kidneys. They are connected by a pair of ducts (*vasa deferentia*) with the cloaca. In the embryo of the female, two ovaries are present but the right wholly degenerates. The end of the left oviduct is expanded to receive the ova as they burst from the ovary. The duct is glandular; the upper

part secretes albumen, to cover the yolk, and the lower secretes the limy shell. The end opens into the cloaca.

HABITS. *Nutrition.* The food of birds varies greatly, not only in different birds, but also to some extent at different seasons. Some are vegetivorous; some confine themselves to a diet of grain, and others combine cereals with insects or with the green parts of plants. Birds which feed primarily on grain have large crops and gizzards, and the glandular part of the stomach is small. In carnivorous birds the glandular predominates over the muscular portion of the stomach.

Locomotion. Most birds use their wings in flight, the feather-covered arms being raised and depressed with great rapidity by means of the breast muscles already described. Strong birds, such as the albatross and birds of prey, can fly very rapidly, and can sustain their exertions for long periods, whereas many other birds rarely take prolonged flights, except during migration. On the ground, birds vary greatly in rate and manner of progression. The swift strides of the ostrich, the rapid run of the partridge, and the hopping of the sparrow are examples of different gaits.

Respiration. Expiration, or the expulsion of air, is managed by the contraction of breast and abdominal muscles, which compress the enclosed cavities and force the air from the sacs and lungs. When these muscles are relaxed, the cavities expand, and fresh air is drawn in.

Song. With few exceptions, birds have vocal organs, and are able to produce more or less variable sounds. The organ is, however, lacking in the running birds, such as the ostrich, and in the American vultures. It is among the so-called perchers (order Passeriiformes), and particularly the songsters (suborder Oscines), that song is developed.

Singing is most marked during the breeding season. It is best, sometimes solely, developed in the males, who use their powers of singing to attract the females.

Molting. After the reproductive period, or sometimes at midwinter, the old feathers drop off, and birds undergo an annual molt. Besides this annual growth of new feathers, many birds molt twice, and some molt three times a year.

Reproduction. Birds usually mate in spring. Fertilization is internal, and all birds are oviparous. The size of a bird's egg depends on a number of factors, including the number of eggs laid in the breeding season, and the degree of maturity of the young of the particular species when hatched. In structure the egg consists of a large yolk, formed in the ovary, upon which floats a small germinal disk or blastoderm from which the embryo develops. As the yolk passes down the upper portion of the oviduct, it becomes coated with fluid white of egg or albumen, which is separated from the yolk by a membrane enclosing the latter. Both the yolk and the white are used for nourishment by the developing embryo. In the lower portion of the oviduct, the yolk and white are enclosed, first in a tough double membrane and then in a three-layered shell composed principally of calcium carbonate. The layers of the enclosing membrane separate at the broad end of the egg, leaving an air space which increases with the age of the egg. As the embryo becomes more mature, this space serves as an air reservoir from which the chick can breathe. The shape of the finished egg varies from an almost perfect sphere, as in the case of owls' eggs, to an almost symmetrical ovoid, as in the case of the eggs of the red-winged blackbird. The coloring of the shell also shows wide variation, in some instances serving as camouflage to conceal the egg and sometimes as protection against the rays of the sun.

Fertilization of the egg occurs in the upper portion of the oviduct prior to the time when the yolk is covered with albumen. The usual cell-division (see EMBRYOLOGY) begins in the lower part of the oviduct, shortly before the shell has begun to be formed. Owing to the vast amount of nutritive, as opposed to formative, material, the whole ovum does not divide, but only a portion of it known as the germinal disk.

The period of incubation varies from ten days to eight weeks. During this period, in almost all species, one or the other of the parents, usually the female, sits on the eggs almost constantly. The number of eggs laid at one time varies from one to as many as twenty-one. In most instances more eggs are laid by species such as migratory birds which are exposed to natural dangers. See EGG.

Nests. The nest-building instinct is not limited to the birds, but occurs also among insects and fishes. The prolonged period of brooding, the frequent helplessness of the young, the very common arboreal habit, and the numerous enemies, have necessitated a most varied series of nest-building contrivances. The nest is built before the eggs are ready to be laid. Each species has its own style and material of construction, though these may be adapted to varying conditions. The

nests are usually solitary, more rarely grouped, and occasionally (as among cassowaries and ostriches) common property. The cuckoo and the cowbird do not build nests, but lay their eggs in the nests of other species. The bill is the organ most used in construction, but the pressure of the body may round off the forming nest, and the feet may also be used.

Migration. Comparatively few birds remain in the same locality for the entire year. They do not hibernate, but migrate on the approach of winter. All birds breed in the colder regions of their migration. Changes in food supply and temperature are the most important conditions impelling them to shift their habitats. At least one bird, the arctic tern, migrates annually from the arctic to the antarctic and back. Birds generally meet in concourses, and migrate in flocks. Only a few fly alone. The return to the breeding grounds is more rapid than the migration to the winter range, being made without young ones or weaklings. The males often return first.

Longevity. Reliable statistics on the maximum life span of birds in the wild state are scanty. In general, longevity varies roughly with the size of the bird; small field birds live for two to six years, domestic fowl for about sixteen, owls (in captivity) sixty-eight, and storks a hundred years.

Distribution and Classification. Some genera of birds are widely distributed, and are represented in almost every land. Others, such as the birds of paradise and the hummingbirds, are restricted in their habitat. Birds have unusually great facility of dispersion, and are more numerous in the warmer countries.

Distribution in Time. The oldest known birds are found in the Upper Oölite. They are the Archaeopteryx (q.v.), from the Solenhofen lithographic slates, and *Laopteryx priscus*, from a nearly equivalent stratum in the Wyoming territory of the western United States. In the Middle and Upper Chalk, numerous fossil birds have been discovered; they are classified together in a superorder of toothed birds, or Odontognathae, in the same subclass as modern birds. Of these the most notable are *Hesperornis* and *Ichthyornis*. In the Tertiary deposits, birds become more numerous, and more like those now existing. Representatives of modern genera are found from the Eocene onward. Many types, such as the great running birds, are found in regions far from their present habitats.

Subfossil and *Historically Exterminated Birds.* Within comparatively recent (semihistoric) times the moas of New Zealand (*Dinornis*), the *Aepyornis* of Madagascar, the Australian *Dromornis* (ancestor of the emu), and others have disappeared. These birds, together with the rheas, ostriches, cassowaries, kiwis, and tinamous, form a superorder, Paleognathae; all other modern birds belong to the superorder Neognathae. In historical times the dodo of Mauritius, the solitaire of the island of Rodriguez, the great auk of the North Atlantic coasts, the passenger pigeon of the Mississippi valley, the *Aphanapteryx* of Mauritius, and many other species have been exterminated by man.

Pedigree. It is generally agreed that birds have evolved from the reptiles. This origin is suggested not only by the general fact that "reptiles" in the wide sense form the nearest distinctly lower class, but by resemblances of structure revealed in anatomical research, and still more by the study of bird embryology. But the principal evidence in favor of this origin is found in the primitive characters of the first known bird (Archaeopteryx), and by the series of forms connecting flying saurians and toothed birds. With another primitive bird, *Archaeornis*, Archaeopteryx forms a subclass, Archaeornithes, from which two branches diverge, represented by the keelless birds (Ratitae) on the one hand, and by the keeled birds (Carinatae) on the other. These divisions correspond approximately to the two superorders of contemporary birds mentioned above.

Classification. In 1944 the American Ornithologists' Union estimated the number of distinct species of living birds to be nearly 14,000, and the number of different kinds, counting subspecies, to be approximately 23,000. Nearly 1500 varieties are found in North America. Several species which have become extinct within historical times and several hundred fossil species are also known. The classification of these numerous forms is still a matter of great difficulty. The older classifications were based on habits or on comparatively trivial characteristics, but the system has improved and is now a more consistent anatomical classification, such as that proposed by the English biologist Thomas Huxley in his paper *Classification of Birds.*

The present system divides the class Aves, the birds, into thirty-three orders which are further subdivided into families. The following list includes all orders which contain any birds now living. For each order, one or more species, each typical of a family, have been listed. Although the list is not complete, it will suggest the number of families in each order.

Anseriformes: Duck, Screamer.
Apterygiformes: Apteryx (Kiwi).
Caprimulgiformes: Goatsucker, Nighthawk, Nightjar, Whippoorwill.
Casuariiformes: Cassowary, Emu.
Charadriiformes: Auk, Gull, Jacana, Lapwing, Oyster Catcher, Phalarope, Plover, Skimmer, Skua, Snipe, Stilt.
Ciconiiformes: Balaeniceps, Flamingo, Heron, Ibis, Jabiru, Stork.
Coliiformes: Coly.
Columbiformes: Dove, Sand Grouse.
Colymbiformes: Grebe.
Coraciiformes: Bee Eater, Hoopoe, Hornbill, Kingfisher, Motmot, Roller, Tody.
Crypturiformes: Tinamou.
Cuculiformes: Cuckoo, Road Runner.
Falconiformes: Falcon, Hawk, Secretary Bird, Vulture.
Galliformes: Curassow, Grouse, Guinea Fowl, Hoatzin, Pheasant, Quail, Turkey.
Gaviiformes: Diver, Loon.
Gruiformes: Bustard, Coot, Crane, Limpkin, Rail, Trumpeter.
Micropodiformes: Hummingbird, Swift.
Passeriformes: Babbling Thrush, Blackbird, Bulbul, Bunting, Cotinga, Creeper, Crow, Dipper, Finch, Flycatcher, Grosbeak, Lark, Mockingbird, Nuthatch, Shrike, Sparrow, Starling, Swallow, Tanager, Thrush, Titmouse, Vireo, Wagtail, Warbler, Waxwing, Wood Warbler, Wren, Wren Tit.
Pelecaniformes: Cormorant, Darter, Frigate Bird, Gannet, Pelican.
Piciformes: Barbet, Puffbird, Toucan, Woodpecker.
Procellariiformes: Albatross, Fulmar, Petrel, Shearwater.
Psittaciformes: Lory, Parrot.
Rheiformes: Rhea.
Spheniscifformes: Penguin.
Strigiformes: Barn Owl, Owl.
Struthioniformes: Ostrich.
Trogoniformes: Trogon.

BIRD, ROBERT MONTGOMERY (1803?–54), American novelist and playwright, born in Newcastle, Del., and educated at the University of Pensylvania. He wrote three popular tragedies for the stage, namely *The Gladiator*, *Oraloosa,* and *The Broker of Bogotá*, but he is now best known for his historical novels, which include *Calavar* (1834), *The Infidel*, and *Nick of the Woods* (1837).

BIRD CHERRY, common name for either of two trees of the Rose family, and for their fruit. **1.** The European bird cherry, *Prunus padus* or *Padus avium*. The tree is small, and bears racemes of small, white flowers and black fruit. Its fruit is used for coloring wines and brandies. **2.** The North American wild cherry, *Prunus pennsylvanica*, also called pin cherry. It grows to a height of about 30 feet, has reddish bark, and bears white blossoms and pea-sized, reddish fruit with an astringent taste. The tree is used as a grafting stock for orchard cherries, and occasionally as an ornamental plant. Cough remedies are made from the bark.

N.Y. Zoological Society

Lesser emerald bird of paradise

BIRDE, WILLIAM. See BYRD, WILLIAM.

BIRD OF PARADISE, common name for birds of the family Paradiseidae, noted for the magnificent plumage of the adult male. They are native to the forests of New Guinea and the adjacent islands, and about fifty species are known, many of them classified from single skins. Protected against discovery by their

natural enemies by their dull color, females and young gather in small flocks; the conspicuous males are often solitary. Their food consists largely of fruit, insects, and snails; they have the omnivorous appetite characteristic of crows and jays. Demand for bird-of-paradise plumage has resulted in the extermination of several species, and others are almost extinct. The great emerald bird of paradise, *Paradisea apoda*, the largest species, is 1½ feet in length, including the tail. It has a dense, erectile tuft of golden-orange plumes, about 2 feet long, arising under each wing, and the central tail feathers are modified into long, wirelike bristles. The feet were removed from the first skins of this species to be sent to Europe, giving rise to the name (*apoda*, "without feet"), and to the erroneous belief that the birds spent their entire lives on the wing. Most of the paradise plumes used for ornament are obtained from the lesser emerald bird of paradise, *P. minor*, which is smaller in size and somewhat less brilliant in coloring. Other species include the king bird of paradise, *Cincinurus regis*, with two tail feathers modified into 6-inch spiral shafts bearing an emerald disk at the end, and the twelve-wired bird of paradise, *Seleucides ignotus*, with twelve lateral plumes ending in 10-inch, black, recurving filaments.

BIRDSEYE, Clarence (1886–1956), American food expert, industrialist, and inventor, born in Brooklyn, N.Y., and educated at Amherst College. He is known as a pioneer (from 1922) in the preservation and marketing of quick-frozen and dehydrated foods. In 1934 he became an independent technologist in such fields as refrigeration, incandescent lighting, wood pulping, and infrared heating. His techniques in the quick freezing of foods were protected by more than two hundred patents.

BIRD'S-EYE LIMESTONE, or Lowville Limestone, in geology, a division of the Trenton group of the Ordovician strata of North America. It is found best developed near Lowville, Lewis Co., N. Y. The rocks contain "bird's-eye" markings due to fossil remains.

BIRD'S-FOOT TREFOIL. See Lotus.

BIRDS OF PREY, common name for the group of birds formerly comprising the order Raptores, and now classified in the orders Falconiformes (vultures, falcons, and hawks) and Strigiformes (owls and barn owls). For the most part, birds of prey feed on warm-blooded animals which they catch alive and tear to pieces with their hooked bills and strong talons. In general, birds of this group have acute sight and hearing, and are above average in size and strength. See separate articles under their present classifications.

BIRDWOOD, Baron William Riddell (1865–1951), British military leader, born in India, and educated at the Royal Military Academy, Sandhurst. He entered the army as a lieutenant in the Royal Scots Fusileers in 1883, and in 1886 was transferred to the Indian Staff Corps. In the Boer War (1899–1902) he served as brigadier general and became military secretary to the commander in chief, Lord Horatio Herbert Kitchener. Birdwood became commander of the Australasian forces in Egypt at the outbreak of World War I. In 1920 he returned to India as head of the Northern Army. He was promoted to the rank of field marshal and commander in chief of the Army in India in 1925. From 1930 to 1938 he was master of Peterhouse College, Cambridge University.

BIR ES SABA. See Beersheba.

BIRGIT or **BIRGITTA.** See Bridget.

BIRKENHEAD, county borough and seaport of Cheshire, England, situated on the estuary of the Mersey R., opposite Liverpool. The cities are linked by ferries, an electric railway tunnel, and a vehicular tunnel. Birkenhead is one of the chief shipbuilding and shipping centers of England, with extensive port facilities, including numerous drydocks and more than 10 m. of wharfage. Other major industries are steel making, flour milling, and meat packing. Saint Aidans Theological College, an Anglican institution, is in the city. In 1829 England's first iron vessel was constructed at the Birkenhead shipyard (established in 1824) of the Scottish shipbuilder William Laird. Completion of a pier system in 1847 initiated the city's commercial development. Sections of Birkenhead were severely damaged by German aircraft in 1940–41, during World War II. Pop. (1953 est.) 141,700.

BIRMINGHAM, county seat of Jefferson Co., Ala., and the largest city in the State, situated near the Warrior R., about 95 miles N.N.W. of Montgomery. It is served by nine railroad systems, has airline service, and is connected with the Gulf of Mexico by means of the Warrior R. Rich deposits of iron ore, coal, and limestone, clay, marble, graphite, bauxite, silica, and quartz are located in the surrounding region. The proximity of these natural resources helped to make Birmingham the industrial center of the South. Iron, steel,

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Aerial view of the business section of Birmingham, Alabama

and iron and steel products, heavy machinery, textiles, clothing, coke, cement, lumber, and foodstuffs are the principal manufactures. Birmingham is the site of Howard College, founded in 1842, Birmingham-Southern College (1856), and Miles College (1907).

Intensive exploitation of the mineral deposits in Jefferson County began in the 1860's. In 1871 a business organization known as the Elyton Land Company founded Birmingham, naming it for the English manufacturing center. The city was incorporated later in the same year and in 1873 it became the county seat. Pop. (1950) 326,037.

BIRMINGHAM, city and county borough of Warwickshire, Staffordshire, and Worcestershire, England, at the confluence of the Rea and Tame rivers, about 95 miles N.W. of London. Situated in central England, near rich iron and coal fields, and served by a network of railroads, Birmingham is the center of the British metal-manufacturing industry. Among the city's principal metal products are machinery, railroad cars, automobiles, bicycles, hardware, firearms, jewelry, and plated metalware. Other leading manufactures are munitions, glass, rubber products, chemicals, rope, and candy. Noteworthy ecclesiastical edifices in Birmingham include St. Martin's Church, dating from 1250 and rebuilt in 1875; St. Philip's Church, constructed in 1711; and the Roman Catholic cathedral of St. Chad. The outstanding secular edifices are the Town Hall (1832), a marble structure patterned after an ancient Roman temple; the Victoria Law Courts (1878), in the Renaissance style; and the buildings of several of the city's educational institutions, notably the Grammar School of King Edward VI, founded in 1552, and Birmingham University, founded in 1898. Additional educational and cultural institutions include Queen's College, founded in 1828, the Central Technical College (1893), the Birmingham Central Library (1779), and the Birmingham Art Gallery (1874).

According to the *Domesday Book* (q.v.), the site of Birmingham was settled as early as the 11th century. During the Middle Ages it was a flourishing commercial center. The town later became known for its handicrafts, especially the making of weapons, cutlery, and other metal products. A Puritan stronghold during the Great Rebellion (1642–49), Birmingham furnished a large part of the arms and equipment used by the anti-Royalist forces. In 1665 the town was ravaged by an epidemic of the bubonic plague. Exploitation of the Lancashire coal and iron resources during the 18th century accelerated industrial development, and by the middle of the 18th century Birmingham's manufactures were known throughout the world. It was constituted a city and county borough in 1889. German aircraft bombed the city in 1941–42, during World War II. Pop. (1953 est.) 1,118,500.

BIROBIDZHAN or **BIRO-BIDJAN.** See JEWISH AUTONOMOUS REGION.

BIROBIDZHAN or **BIRO-BIDJAN,** capital of Jewish Autonomous Region, Soviet Russia, situated on the Trans-Siberian Railroad, about 100 miles W. of Khabarovsk. It is the industrial and cultural center of the Region. Industrial establishments include railway-repair shops, shoe factories, clothing plants, lumber mills, brick works, and power plants. Among the cultural institutions are an agricultural college and several other schools of higher learning, a number of libraries, and a Jewish Art Theater. Pop. (1939) 29,654.

BIRON, title of a French noble family, the most prominent members of which were the following. **1.** ARMAND DE GONTAUT, BARON DE BIRON (1524?–92). During the religious wars (1562–98) in France between the Catholics and the Huguenots, he supported the Catholics. In 1577 he was made marshal of France by King Henry III. In the wars for control of France that followed the accession to the French throne of King Henry IV, Biron supported the king and fought in the battles of Arques (1589) and Ivry (1590). He was killed during the siege of Épernay. **2.** CHARLES DE GONTAUT, DUC DE BIRON (1562–1602), son of Armand. He served King Henry IV, who made him admiral in 1592, marshal in 1594, and duke in 1598. In 1602, however, Biron conspired to overthrow the king and to seize the throne of the province of Burgundy, of which he was then governor. He was arrested, and beheaded in the Bastille. **3.** ARMAND LOUIS DE GONTAUT, DUC DE BIRON (1747–93), great-grandnephew of Charles. Under the name of the Duc de Lauzun, he fought on the American side in the American Revolution. In 1789, during the French Revolution, he was elected to the States-General, the French legislature, by the nobility, but favored the Revolutionary cause. He became a general in the Revolutionary army and in 1793 commanded the forces fighting counterrevolutionary insurgents in the La Vendée region. Accused of being too lenient toward the counterrevolutionists, Biron was removed from his command and guillotined.

BIRON, ERNST JOHANN, DUKE OF KURLAND, original surname BÜHREN (1690–1772), Russian statesman, born in Kurland. He was made duke of Kurland in 1737, and through the influence of Empress Anna Ivanovna, who ascended the throne of Russia in 1730, became chamberlain and virtual ruler of Russia. Biron ordered the execution or banishment of many of his enemies and rivals, and his entire career was notorious for the cruelty and unscrupulousness with which he pursued his ambitions. On the death of the empress in 1740, he assumed the regency for her son Ivan IV, but three weeks later was arrested by the nobles of Russia, who had resented his authority during Anna's reign. In 1741 Biron was sent to Siberia. He was permitted to return in 1742, but never regained his influence.

BIRRELL, AUGUSTINE (1850–1933), English author, barrister, and statesman, born near Liverpool, and educated at Trinity Hall, Cambridge University. From 1889 to 1900 he was Liberal member of Parliament for West Fife, and from 1896 to 1899 he was professor of law at University College, London. He was secretary for Ireland in the British cabinet from 1907 to 1916, and during his administration the Irish Universities Act, the Irish Land Act, and the Home Rule Act were passed by Parliament. His writings include *Obiter Dicta* (1884), *Res Judicatæ* (1892), *In the Name of the Bodleian* (1905), *More Obiter Dicta* (1924), and *Et Cetera* (1930).

BIRTH, the beginning of independent life; the expulsion of the young from the body of the mother. In man, normal birth occurs after a period of gestation (q.v.) of 270 to 280 days, and is accomplished by the physiological process called labor. Contractions of the uterus force the fetus through the birth canal, dilating the tissues of the cervix and vagina. Shortly after expulsion of the fetus, the uterus again contracts, expelling the placenta or afterbirth; see EMBRYOLOGY: *Nutrition and Respiration.* Although it is variable, the duration of labor is usually expected to be eighteen hours for the first child and twelve hours or less for subsequent children. See MULTIPLE BIRTH.

In law, the process of birth is not considered complete until the infant is entirely separated from the mother (for example, by cutting the umbilical cord), and has given evidence of independent life, even if only for an instant. Many legal rights depend on proof of such "living issue". In some other legal matters, however, a yet unborn child is regarded as an individual person and may, for example, be designated a legatee, the inheritance taking effect if the child is born alive. See also INFANTICIDE.

BIRTH CONTROL. See PLANNED PARENTHOOD.

BIRTHMARK. See NEVUS.

BIRTHWORT. See ARISTOLOCHIA.

BIRU (fl. 16th cent.), South American Indian chieftain after whom the country of Peru

is named. Biru defeated in battle a Spanish exploring expedition under Gaspar de Morales in 1515. The Spaniards at first called all the territory south of Panama "Biru's Country", but after 1526 the name Biru, or Peru, was restricted to the land of the Incas (q.v.).

BIRUNI, AL-, Arabian name ABU-AL-RAYHĀN MUHAMMAD IBN-AHMAD AL-BIRUNI (973–1048), Arabian scholar and author, born in the region of Khwarizm, Persia (now Iran). Some time after 1000, when he finished his great historical work *Kitab al Athar al Bakiya*, he settled in India, where he taught such subjects as mathematics and astronomy. About 1017 he returned to his native country, and he spent the last years of his life in Ghazni, Afghanistan. Among his other works is an extensive account of the civilization of India, written about 1030.

BISCAY or **VIZCAYA,** Basque province of Spain, lying on the Bay of Biscay, between the Pyrenees Mountains to the E. and the Cantabrian Mountains to the W. Most of the surface, hilly in general and mountainous in the south, is covered with forests. About 10 percent of the soil is cultivated, chiefly for the growing of *chacoli* wine grapes. The province abounds in minerals, especially iron, which is mined and exported in large quantities. Among the chief industrial products are railway cars, textiles, paper, glass, and chemicals. The coastal fisheries yield valuable catches of cod and anchovy. Bermeo is the center of the fishing industry. The capital and chief port is Bilbao (q.v.). Other important centers of the province are the communes of Baracaldo (pop. in 1940, 36,165), Sestao (pop. in 1940, 18,625), and Guecho (pop. in 1940, 17,795). Area of the province, 857 sq.m.; pop. (1950) 569,188.

BISCAY, BAY OF (anc. *Mare Cantabricum*, or *Aquitanicus Sinus*, or *Sinus Cantabricus*, or *Cantaber Oceanus*), vast embayment of the Atlantic Ocean, bounded on the N. and N.E. by France and on the S. by Spain. Its maximum width and length are about 400 m. The depth of water ranges from about 120 ft. to 1200 ft., with extreme depths occurring along the Spanish coast. The S. coast is precipitous and rocky, in some places rising to a height of several hundred ft. In the N., between the mouths of the Adour and Gironde rivers, the coast is low and sandy, with numerous lagoons. Low marshland prevails for a distance of about 200 miles N. of the Gironde, but beyond the Quiberon Peninsula the coast is moderately elevated and rocky. The bay receives numerous streams from the mountains of Spain, and, through the rivers Loire, Charente, Gironde, and Adour, the waters of half the surface of France. Its chief ports are Gijón, Santander, Bilbao, San Sebastián, and Pasajes in Spain; and Bayonne, Bordeaux, Rochefort, La Rochelle, Nantes, and Lorient in France. Among the principal islands in the bay are Belle-Île-en-Mer, Noirmoutier, Ré, and Oléron. Navigation is difficult and dangerous, due to the prevailing N.W. winds and a strong current.

BISCHOFF, THEODOR LUDWIG WILHELM (1807–82), German physiologist and embryologist, born in Hanover, and educated at the universities of Bonn and Heidelberg. He was professor of anatomy and physiology at Heidelberg from 1836 to 1844, at the University of Geissen from 1844 to 1855, and at the University of Munich from 1855 to 1878. He demonstrated the presence of oxygen and carbon dioxide in the blood, but is best known for the proof submitted in his treatise *Evidence for the Periodic Ripening and Detachment of the Ova in Man and the Higher Mammals* (1844).

BISHOP (Gr. *episkopos*, "overseer"), in the early Christian Church, an overseer of one or a number of local churches, and, especially in the Anglican, Orthodox, and Roman Catholic churches today, one in the highest order of the ministry. The precise status and function of bishops in the earliest days of the Church is a matter of controversy. Overseers of various churches were called *bishops* and *presbyters* indiscriminately, and only gradually did the words acquire a distinction in meaning, with *bishop* designating an overseer of pastors as well as laity. According to the *episcopalian* theory held by the Anglican, Orthodox, and Roman Catholic churches, the first bishops were the Twelve Apostles, who ordained delegates and successors and transmitted to them the apostolic authority and priority of rank. These and other churches claim an unbroken succession of bishops from apostolic times. According to the *presbyterian* theory no trace of a graded hierarchy was to be found in the early Church, and the office of Apostle was limited to the original Twelve and could not be transmitted. Differences in rank arose by a political process as the chief cities of the larger civil provinces became seats of extensive dioceses, the bishops of these sees assuming the distinctive titles of *patriarch*, *metropolitan*, or *papa*—titles of courtesy that had long been applied to all bishops; while the less important provinces, with their capi-

tals and bishops, became subordinate. Among provincial bishops, those of Alexandria, Constantinople, and Rome acquired great prominence. The beginnings of the ascendancy of the Roman pontiff are indisputably discernible as early as the end of the 2nd century.

In the Roman Catholic Church the episcopal office is the foundation of the hierarchy. Bishops have the management of the Church property in their respective dioceses, and the supervision of all ecclesiastical institutions. They are appointed by the pope, and their consecration normally takes place at the hands of three bishops, this number having been customary from post-Apostolic times, though a single consecrator would suffice for validity. (For the special vestments worn by Roman Catholic bishops, see COSTUME, ECCLESIASTICAL).

In the Anglican Church bishops are, in theory, elected by the chapter of each cathedral church by virtue of a license from the crown; in actuality, however, the bishops of the Church of England are appointed by the crown on the advice of the prime minister, since no chapter ventures to disregard the nomination which accompanies the *congé d'élire*. A bishop cannot be *deposed*, as it is supposed that the order itself cannot absolutely be taken from him; he may, however, be *deprived*, or he may resign his see; and he may be *translated*, i.e., removed from one see to another. The Dean and Chapter of Canterbury claim it as an ancient right of that church that every bishop of the province should be consecrated in that cathedral, or the archbishop should receive from them a license to consecrate elsewhere. Bishops, upon their election, become peers of the realm and have seats in Parliament along with other nobles; but the right under which they sit there, whether in respect of their baronies or by usage and custom, is a matter of uncertainty. In regard to their persons bishops are not peers with the nobility; in case of alleged crimes they are tried by a jury in the same manner as commoners.

In the Protestant Episcopal Church of the United States, the functions of the bishops, in religious matters, are similar to those of Anglican prelates. They are chosen to office by a convention of clerical and lay deputies of the diocese over which they are to preside. except in case of missionary bishops, who are nominated by the House of Bishops and are elected by the House of Clerical and Lay Deputies. In the Methodist Episcopal Church bishops are elected by the General Conference. Their duties are those included in a general superintendence of the whole church. Authority is vested in them all, and its administration distributed among them by mutual agreement. They preside over meetings of the annual conferences, ordain ministers, and appoint them to their fields of labor. Other Protestant bodies in the United States have adopted the episcopal form of government, among them the United Brethren in Christ and the Evangelical Association.

BISHOP, SIR HENRY ROWLEY (1786–1855), English composer, born in London. From 1810 to 1840 he was composer and musical director for various London theaters. He helped found the London Philharmonic Society in 1813 and served as one of its first conductors. In 1842 he was knighted by Queen Victoria, becoming the first musician ever to receive the honor. Bishop held a professorship of music at Oxford University from 1848 until his death. His compositions include numerous operas, glees, cantatas, and incidental music, but he is best remembered for his songs, notably "Home, Sweet Home", to lyrics by the American playwright John Howard Payne, "Lo! Here the Gentle Lark", and "My Pretty Jane".

BISHOP, WILLIAM AVERY (1894–1956), Canadian military aviator, born in Owen Sound, Ontario, and educated at the Royal Military College, Kingston, Ontario. In 1914, following the outbreak of World War I, he was assigned to duty with the Canadian expeditionary force in France. He transferred to the Royal Flying Corps in 1915. Bishop was officially credited with having shot down seventy-two enemy aircraft, the third-highest record achieved by an aviator of the Allies. In 1938 Bishop became air marshal of Canada and in 1940, during World War II, was appointed director of air-force recruiting. He is the author of *Winged Warfare, The Flying Squad, Hunting the Huns in the Air, Winged Peace* (1944), and numerous articles on aviation.

BISKRA, town of Constantine Department, Algeria, about 120 m. by rail s.w. of Constantine. The town lies in a fertile oasis of the Sahara Desert. Fruitgrowing is a major enterprise; dates, apricots, and pomegranates are the principal crops. Because equable climatic conditions prevail during the winter season it is a popular winter resort. Fort St. Germain, an important French military post, is situated in Biskra. Carpets and hooded cloaks (burnooses) are the town's chief manufactures. In antiquity the site of Biskra was occupied by a Roman military station. The

Arab conqueror of North Africa, Sidi Okba, was killed near the town in 682; his tomb bears the oldest known Arabic inscription in North Africa. In 1844, after centuries of Moorish rule, Biskra was seized by the French. Pop. (1948) 36,347.

BISMARCK, capital of North Dakota and county seat of Burleigh Co., situated on the E. bank of the Missouri R., about 195 m. by rail W. of Fargo. It is a trading and distributing center for a large area, and the center of the lignite coal-mining industry of the State. Industrial establishments in Bismarck include grain elevators, flour mills, foundries, and meat-packing plants. The State penitentiary, a large World War I Memorial and Auditorium, and a junior college are located in the city. The capitol, which was completed in 1932, is an outstanding example of modern architecture.

In the 1860's and 1870's, with the development of river transportation on the Missouri, two small settlements known as "Crossing on the Missouri" and "Burleightown" were established near the present site of Bismarck. The exact site of the city was originally occupied by Camp Greely, a military post established in 1872. Bismarck became the capital of Dakota Territory in 1883, ten years after the inauguration of rail transportation to the city. Upon the division of the Territory and the admission of North Dakota to the Union, in 1889, Bismarck became the capital of the State. Pop. (1950) 18,640.

BISMARCK or **BISMARCK-SCHÖNHAUSEN,** PRINCE OTTO EDUARD LEOPOLD VON (1815–98), Prussian statesman and first chancellor (1871–90) of the German Empire, born in Schönhausen, and educated at the universities of Göttingen and Berlin. He was a member of the Prussian Diet in 1847 and 1849, and from 1851 to 1858 represented Prussia at the Diet of the Germanic Confederation in Frankfurt am Main. In 1859 he became Prussian ambassador to Russia and in 1862 to France. In September, 1862, William I, King of Prussia, made Bismarck head of the Prussian cabinet and minister of foreign affairs. Bismarck then entered on his major lifework, the unification of Germany under Prussian leadership and the establishment of a unified Germany as the most powerful European nation.

To achieve his aim Bismarck provoked a series of wars. First he maneuvered Austria, Prussia's chief rival in the Germanic Confederation, into alliance with Prussia in a war against Denmark over the control of

Prince Otto von Bismarck

Schleswig-Holstein. When Denmark was defeated, Prussia and Austria disagreed on the disposition of the duchy of Holstein, and Prussia defeated Austria in the ensuing Seven Weeks' War (q.v.). After the war Bismarck changed the Germanic Confederation into the North German Confederation and excluded Austria from its membership. In 1870 Bismarck provoked the Franco-German War (q.v.) in which, under Prussia's leadership, a coalition of German states defeated France. At the end of the war (1871), all Germany was unified as the German Empire. William I of Prussia became emperor and made Bismarck his chancellor.

As chancellor, Bismarck engaged in an unsuccessful struggle (see KULTURKAMPF) with the Catholic Church; suppressed Socialist political activity; established government ownership of some industrial enterprises; and instituted compulsory accident, sickness, and old-age insurance for workingmen. He arranged the Berlin Conference of 1884–85, which laid down the lines upon which Africa was subsequently partitioned (see AFRICA: *History*), and in 1878 presided over the Congress of Berlin (see BERLIN, CONGRESS OF), which dealt with the political status of the Balkans and the Near East. In 1882 Bismarck was instrumental in forming the military and political coalition known as the Triple Alliance (q.v.), consisting of Germany, Austria-Hungary, and Italy. After William II became

emperor in 1888, Bismarck frequently disagreed with him over Germany's foreign policy. In 1890 the emperor dismissed Bismarck from office, but granted him the title of Duke of Lauenberg.

Bismarck, known as "the Iron Chancellor", is generally regarded as the greatest European diplomat of the 19th century. He transformed Germany from a group of conflicting kingdoms and principalities into a united nation and one of the world's great powers. He is the author of *Gedanken und Errinerungen* (1898).

BISMARCK ARCHIPELAGO, a group of more than 200 islands and islets in the Pacific Ocean, N.E. of New Guinea and S. of the equator, forming a part of the Australian-administered Territory of New Guinea (q.v.). The principal islands are New Britain (area, 14,150 sq.m.), New Ireland (about 3340 sq.m.), Lavongai (about 460 sq.m.), Duke of York Islands (22 sq.m.), and the Admiralty Islands (about 800 sq.m.). Among other groups in the archipelago are the Saint Matthias Group, Vitu Islands, and Umboi Islands. Generally semicircular in configuration, the archipelago partly encloses Bismarck Sea. Melanesians comprise a majority of the population. Cacao, copra, and shellfish are the leading products. Known originally as New Britain Archipelago, the archipelago was proclaimed a German protectorate in 1884 and given its present name in 1885. Australian forces occupied the islands in 1914, after the outbreak of World War I. Australia obtained control of the archipelago under the terms of the League of Nations mandate (1920) establishing the Territory of New Guinea. The islands were invaded by Japanese forces in 1942, during World War II, and were retaken by Allied troops in 1944. Area of archipelago, about 20,000 sq.m.; pop. (1952) 131,590.

BISMUTH, metallic element of at.no. 83, at.wt. 209.00, m.p. 271° C. (520° F.), b.p. 1450° C. (2642° F.), sp.gr. 9.80, valence 3 to 5, and symbol Bi. It was known to the ancients, but until the middle of the 18th century was confused with lead, tin, and zinc. In the earth's crust bismuth is about as common as silver; most industrial bismuth is obtained as a by-product of the refining of lead, copper, silver, and gold.

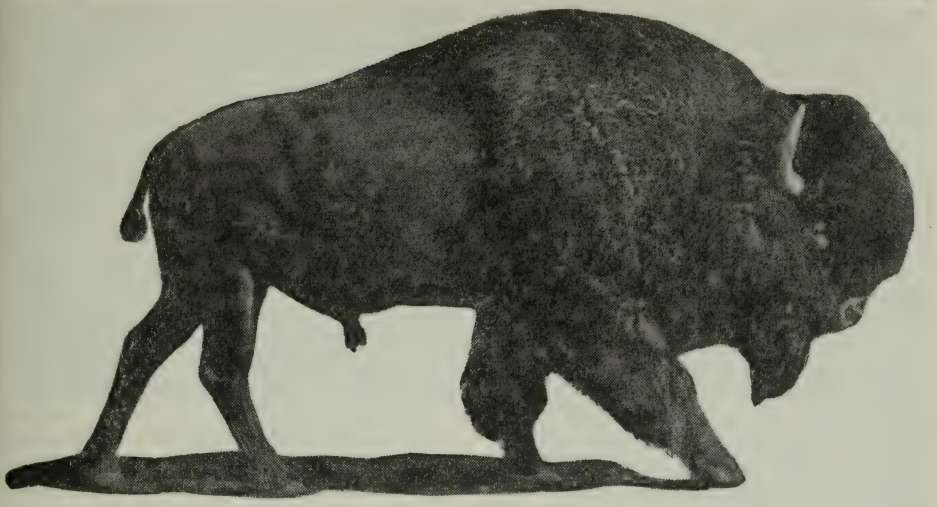
Bismuth is chemically a typical metal, although it sometimes shows nonmetallic properties (see ARSENIC). In compounds it has valences of 3 to 5, the compounds with trivalent bismuth being more stable. Even the latter compounds are generally unstable in the presence of water, reacting to form basic salts. Thus, bismuth nitrate reacts with water to form basic bismuth nitrate, $BiONO_3$, also called bismuth ozynitrate, bismuthyl nitrate, or bismuth subnitrate. This compound is often used in medicine and cosmetics, under the name of bismuth subnitrate, pearl white, pearl powder, blanc de fard, or blanc d'Espagne; it acts as a soothing astringent for irritated mucous membranes, often being administered by mouth for digestive ailments.

Bismuth has a distinct pink tinge: the only metal other than copper and gold which is not silver white in color. It shrinks on melting and expands on solidifying, and some of its alloys have unusually low melting points. Wood's alloy (4Bi, 2Pb, 1Sn, 1Cd), for example, melts at 65° C. (149° F.). One of the most strongly diamagnetic of all substances, bismuth is repelled by a magnet, and a bar of the metal tends to turn at right angles to a magnetic field. A poor conductor of heat and electricity, its electrical resistance is further increased in a magnetic field; this property is utilized in instruments for measuring the strength of such fields. Among the stable elements bismuth has the highest atomic weight and atomic number; it is therefore most opaque to X rays, and is sometimes used in fluoroscopy.

BISON, either of the two living species of the genus *Bison* in the family Bovidae. It is similar to the domestic ox except that it has a hump just behind the neck, a broader convex forehead, longer limbs, and a shaggier head and shoulders. It has 14 pairs of ribs; all other oxen (except the yak) have 13. The heavy, curved horns grow throughout life, and are black in young bison, becoming grayish with advancing age. The Amercian bison, *B. bison,* has shorter and thicker horns than the European bison, *B. bonasus,* and its coat is thicker; both have very shaggy hair, much of which is shed each spring. A large bull of either species measures about 10 feet in length and 6 feet in height at the shoulder, and weighs almost a ton.

The European bison, or zubr, was common in southeastern Europe in the 1st century B.C. It is now extinct, except for one or two small, protected herds.

Until recent times the bison was abundant in America, especially on the prairies beyond the Mississippi R., between Canada to New Mexico. Now it is nearly extinct—a result of hard winters, cattle-ranching, railroads, and immigration. A few hundred are preserved in the Yellowstone National Park, on the Flathead Reservation, in Montana, and in various



The American bison

zoological parks. The Canadians preserve a herd in the Banff National Park.

BISSAU or **BISSÃO**, capital and chief port of the colony of Portuguese Guinea, West Africa, situated near the mouth of the Geba R. The principal products of the colony, including nuts, hides, rice, and wax, are exported through Bissau. Pop. (1940) 3362.

BISTRITA or **BISTRITSA**, river of Romania, rising in the Carpathian Mountains. It flows S.E. through Bucovina and Moldavia, and joins the Sereth R. just below Bacău, after a course of about 185 m.

BITHYNIA, country of ancient Asia Minor, lying on the s. shores of the Pontus Euxinus (present-day Black Sea), the Propontis (Sea of Marmara), and the Bosporus Thracius (Strait of Bosporus). A mountainous region, with heavy forests and fertile valleys, Bithynia acquired its name from the Bithyni, a tribe that immigrated from Thrace. The country was conquered by King Crœsus of Lydia in 560 B.C. and on the subjugation (546 B.C.) of Lydia by the Persians it became a dominion of Persia. In 334 B.C. the Macedonian ruler Alexander the Great occupied Bithynia. The country was ruled for a period after his death (323 B.C.) by Antigonus Cyclops, one of the Macedonian generals who partitioned Alexander's empire. Antigonus founded (about 316 B.C.) Nicæa (modern Izmit), later one of the chief cities of Bithynia. Led by a native prince named Zibœtes, the Bithynians won independence from Macedonian rule early in the 3rd century B.C. The first dynasty of Bithynian kings was established by Zibœtes' son Nicodemus I, who founded Nicomedia in 264 B.C. and made it his capital. Bithynia flourished under the dynasty's succeeding kings, notably Prusias I, Prusias II, who founded Prusa (modern Bursa), Nicomedes II, and Nicomedes III. In 74 B.C. Nicomedes III, a close ally of the Romans bequeathed the kingdom to Rome. It was then united with the Roman province of Pontus for administrative purposes. Under later Byzantine rule, the territory of Bithynia was restricted to an area west of the Sangarius (now Sakarya) River. It formed a province in the Diocese of Pontus. In 1298 A.D. Bithynia was overrun by the Seljuk Turks under Osman, and thereafter the region formed an integral part of the Ottoman Empire.

BITLIS, capital of an il of the same name, Turkey in Asia, situated about 15 miles S.W. of Lake Van, at an altitude of 4700 ft. Textile plants and bazaars are located in the town. The il's principal industry is farming. Fruits and tobacco are among the chief crops. Near the town of Bitlis, in 1554, a Persian army defeated a Turkish force under Sultan Suleiman I (the Magnificent). Prior to 1940 the region comprising the il formed part of Muş Il. Area of il, 6372 sq.m.; pop. (1950) 88,422. Pop. of town (1950) 11,152.

BITTER, KARL THEODORE FRANCIS (1867–1915), Austrian-American sculptor, born in Vienna, and trained at the Vienna Academy of Fine Arts. He came to the United States in 1888 and was subsequently naturalized.

Among the works for which he won world renown are the Astor Memorial bronze doors of Trinity Church in New York City; sculptures for the Chamber of Commerce building and the Metropolitan Museum of Art in New York City; and the memorial to the German-American legislator and publicist Carl Schurz and an equestrian statue of the German-American soldier Franz Sigel, both in New York City.

BITTERN, common name for birds of the subfamily Botaurinae in the Heron family. They resemble other herons in habits and habitat, but in general have shorter necks and legs. The plumage is brown, yellow, and black, variously striped and speckled. Bitterns are solitary birds, inhabiting reedy and marshy places. At the approach of a human being, they stand motionless with head up and neck vertical, so that their brown-streaked plumage renders them virtually indistinguishable from the surrounding reeds. The bird is sluggish, and its flight is neither swift nor long sustained. When assailed, it fights desperately with bill and claws. The bittern makes a rude nest of sticks or reeds in its marshy haunts, and lays four or five greenish-brown eggs each breeding season. *Botaurus stellaris,* the bog jumper, is the common bittern of Europe, and is widely distributed over the Old World; *B. australis* is native to Australia; and *B. lentiginosus* can be found, at some season of the year, in all parts of the U.S. and most of Canada. Another genus, *Ixobrychus,* the least bittern, is found only in the U.S. and attains a length of 13 inches; species of *Botaurus* average 28 inches in length. In both genera the feathers can be erected so as greatly to increase the apparent size of the bird.

Least Bittern in "frozen" position

BITTERROOT. See LEWISIA.

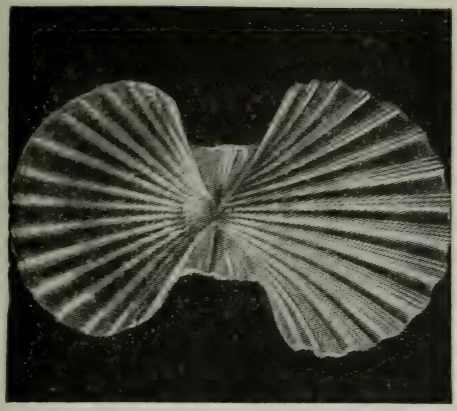
BITTERROOT, or BITTER ROOT, MOUNTAINS, a range of the Rocky Mountains, extending for about 400 m. on the border between Idaho and Montana. The name is derived from the bitterroot, a flowering plant of the region.

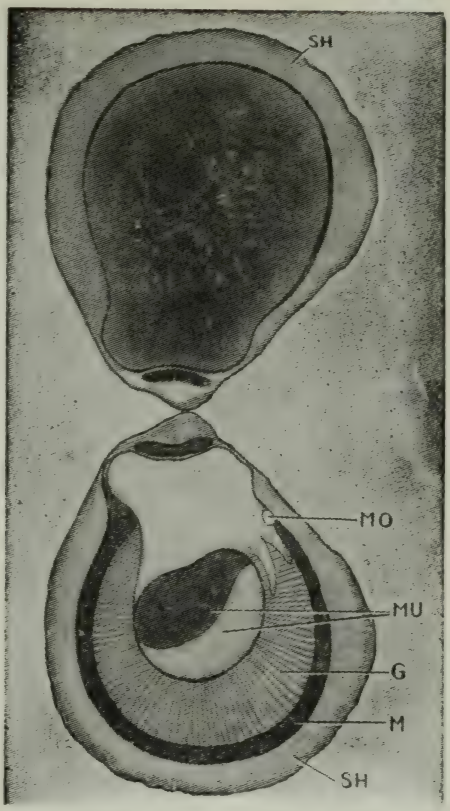
BITTERSWEET, or WOODY NIGHTSHADE, common name for a plant, *Solanum dulcamara,* in the Nightshade family, native to Great Britain and naturalized in North America. The root is perennial and creeping, and gives rise to annual, climbing or trailing stems, 4 to 6 feet in length. Purple or blue flowers borne in drooping corymbs are followed by ovate, red berries. A fluid extract prepared from the twigs contains an alkaloid, solanine, and is used in treating skin diseases; see SOLANUM. Climbing or shrubby bittersweet is an unrelated plant; see WAXWORK.

BITTERWOOD, common name for several trees and shrubs in the Ailanthus family, natives of tropical America and the West Indies. Typical species are *Simarouba glauca, Quassia amara,* and *Picrasma excelsum,* which reach a height of about 15 ft., and bear racemes of red flowers and large, pinnate leaves with winged stalks. The wood of these trees contains a bitter substance, quassia, which protects it from attack by insects. An extract of quassia is used in medicine to treat digestive disorders and to destroy or expel intestinal worms.

BITUMINOUS COAL, or SOFT COAL, a variety of coal intermediate in constitution and properties between anthracite (q.v.), or hard coal, and lignite (q.v.), or brown coal. A typical bituminous coal contains 5 to 10 percent ash, 60 to 75 percent fixed carbon, 2 to 4 percent water, and 20 to 35 percent total volatile matter. Coal with slightly more carbon is called semibituminous, and coal with slightly less is called subbituminous. Although anthracite is generally preferred as a fuel, bituminous coal is better for the manufacture of coke, coal tar (qq.v.), and illuminating gas (see GAS: *Coal and Coke-Oven Gas*). Cannel coal is a variety of bituminous coal. See COAL.

BITZIUS, ALBERT, pen name JEREMIAS GOTTHELF (1797–1854), Swiss author, born in Morat, Fribourg Canton, and educated at the University of Göttingen. Bitzius achieved a wide reputation through his novels and short stories of rural Swiss life. Among his writings are *Käthi, die Grossmutter* (1847); *Uli, der*





BIVALVES OF THE CLASS PELECYPODA

Above: Shell of a European cockle. Right: Opened oyster, with adductor muscle cut from top valve. MO, mouth; MU, adductor muscle; G, gill; M, mantle: SH, shell.

Knecht (1841) and its sequel, *Uli, der Pächter* (1849); and *Erzählungen und Bilder aus dem Volksleben der Schweiz* (5 vols., 1852–55).

BIVALVE, any animal having two shells approximately equal in size, and connected by a hinge of ligament. Several groups of animals develop in this fashion, for example, the phylum Brachiopoda (q.v.) and a subclass of crustaceans, the Ostracoda. This article deals only with the so-called true bivalves, such as the clam, a class of mollusks called by some authorities Pelecypoda (Gr. *pelekys*, "hatchet"; *podon*, "foot") and by others Lamellibranchia (Lat. *lamella*, "little plate"; Gr. *branchia*, "gills").

Bodies of pelecypods are strongly compressed, the dorso-ventral diameter being much greater than the lateral. The shell is lined by an organ called the mantle, containing glands which secrete the substance of the shell. Gills in the form of thin, vascular plates of membrane are outgrowths of the inner surface of the mantle. The hinge joining the two valves of the shell has an elastic construction which tends to keep it open but, during life, the shell is kept closed by a large, strong muscle or pair of muscles, the adductor muscles. As a rule the shell when closed covers the entire animal, but in some species as, for example, the shipworm (q.v.), the shell covers only a small part of the body.

Locomotion in pelecypods is accomplished by swimming, crawling, or burrowing; many species are provided with a hatchet-shaped muscular organ called the foot. In all cases, the amount of motion is slight. Pelecypods depend for food, consisting of plankton and organic debris, on currents of water continually brought into the mouth by minute hair-like processes called cilia. Some, such as the clam, have two long tubes, or siphons, extending several inches beyond the shell. Water is brought in through one tube, gives up its oxygen to the gills and its food to the toothless mouth, and passes out through the other tube, carrying away the waste and, at the proper season, the eggs of the female or the sperm of the male. Such bivalves are sedentary, spending their lives buried in mud or sand with only the tips of the siphons exposed. Many pelecypods have eyes in the mantle, and an *otocyst* or ear in the foot. The heart is three-chambered, consisting of two auricles and one ventricle.

Great numbers of eggs are produced by pelecypods; for example, some oysters produce 2,000,000 each season. Larvae pass through two free-swimming stages, the univalve *trocophore* and the bivalve *veliger*. The adult form is often developed from the egg

within a year; some species have a life span of thirty years. In size the adults range from minute forms measuring 0.04 in. to the giant clam of the East Indies which attains 3 ft. in length.

About 14,000 species of pelecypods are known; more than half of these species are fossils. The classification is difficult, since it depends largely on the structure of the gills, and no trace of gills is preserved in the fossils. Living pelecypods are found in both fresh and salt water in all parts of the world. They form an important part of the food of many food fishes and birds, and of mammals such as the walrus. Many of them are eaten by man. The shell lining of many species constitutes the nacre or mother-of-pearl of commerce, and genuine pearls are obtained only from certain species of this class (see PEARL). See MOLLUSCA; CLAM; COCKLE; MUSSEL; OYSTER.

BIWA or **OMI**, largest lake of Japan, situated in the southern part of the Japanese mainland (Honshu Island), about 10 miles N.E. of Kyoto, and having an area of 180 sq.m. A canal connects it with the Kamogawa Canal and affords water power to Kyoto. Biwa Lake figures prominently in Japanese history and legends, and because of its beauty has frequently been the theme of Japanese poetry.

BIZERTE or **BIZERTA** (anc. *Hippo Zarytus*), fortified seaport of the French protectorate of Tunisia, situated on the coast of the Mediterranean Sea, about 60 m. by rail N.W. of Tunis. An artificial outer harbor, about 300 acres in area, is connected by canal with two inner harbors, namely the Bay of Sebra and Lake Bizerte. On the shores of Lake Bizerte, covering about 50 sq.m., are important French naval installations, including dry docks and an arsenal, and Ferryville, a military post. Olives are grown in the surrounding region, and the lake contains valuable fisheries. Fish and olive oil are among the chief articles of commerce.

The site of Bizerte was occupied originally by colonists from the Phenician capital Tyre. After the destruction of the Tyrian city of Carthage by the Romans at the close of the Third Punic War (149–146 B.C.), the town became a Roman colony. The Vandals took it from the Romans in the 5th century A.D. and in 534 it became a possession of the Byzantine (Eastern Roman) Empire. After the 7th century the town was held by the Arabs. Bizerte was then one of the finest ports on the Mediterranean Sea, but in subsequent years the harbor was neglected. Following 1881, when France seized Tunisia and made it a protectorate, the French dredged channels and canals, built breakwaters and docks, and further modernized the harbor. By 1895 Bizerte ranked next in importance to Toulon among French ports on the Mediterranean seaboard. German and Italian military forces occupied the port early in World War II. On May 7, 1943, toward the close of the Allied campaign in North Africa, Bizerte was captured by British and American troops. Pop. (1946) 39,327.

BIZET, ALEXANDRE CÉSAR LÉOPOLD, usually known as GEORGES (1838–75), French composer, born in Bougival, near Paris, and trained at the Paris Conservatory under the French composer Jacques Halévy. Bizet is best known for his operas, which include *Les Pêcheurs de Perles* (1863), *La Jolie Fille de Perth* (1867), and *Djamileh* (1872). The opera *Carmen* (1875) is generally considered his most important work; though not an immediate success, it soon became one of the most popular works in operatic history, and is performed throughout the world. Bizet's other compositions include a symphony, the symphonic suite *Roma* (1866–68), incidental music (1872) to the play *L'Arlésienne* by the French author Alphonse Daudet, the dramatic overture *Patrie* (1873), and works for piano and for voice.

BJÖRNEBORG. See PORI.

BJÖRNSON, BJÖRNSTJERNE (1832–1910), Norwegian writer, theater director, and political leader, born in Kvikne, and educated at Frederick University in Christiania (now Oslo). He left the university before being graduated, to pursue a literary and journalistic career, during the course of which he wrote voluminously on the outstanding social, political, moral, and esthetic questions of the time. He was also influential in the creation of an indigenous Norwegian literature with roots in the early culture of Norway. His plays rank among the earliest and most important examples of native Norwegian dramatic literature, and, between 1857 and 1872, he was at various times director of theaters in Bergen and Christiania. Björnson's novels and tales also contributed to the growth of a typically Norwegian school of writers of fiction. In 1903 he was awarded the Nobel Prize for literature.

Björnson was also regarded as the greatest contemporary orator of the Scandinavian countries. He was a leader in the political struggle which led to the dissolution, in 1905, of the union of Norway and Sweden and to

the establishment of Norway as an independent country. His numerous works include the plays *Between the Battles* (1857), *Mary Stuart in Scotland* (1864), *A Bankruptcy* (1875), *Beyond Human Power* (1883), *Paul Lange and Tora Parsberg* (1898), and *When the New Wine Blooms* (1909); the novels *Arne* (1858), *The Fisher Maiden* (1868), *Magnhild* (1877), and *In God's Way* (1889); and the cycle of epic poems *Arnljot Gelline* (1870).

BJÖRNSSON, Sveinn (1881–1952), Icelandic statesman, born in Copenhagen, Denmark, and educated at Reykjavik College and the University of Copenhagen. Björnsson began to practice law in Iceland in 1907. He served as special envoy to the United States and England in 1914 and 1915, respectively. From 1920 to 1924 and again from 1926 to 1941 he was Icelandic minister to Denmark. Björnsson became regent of Iceland in 1941; three years later, when the country was proclaimed a constitutional republic, he was elected its first president. He served in the latter post until his death.

BLACK, Hugo La Fayette (1886–), American jurist, born in Harlan, Clay Co., Ala., and educated at the University of Alabama. He practiced law in Birmingham, and was the prosecuting attorney of Jefferson County, Ala., from 1915 to 1917, when he entered the army. After World War I he resumed his law practice, and from 1927 to 1937 he was U.S. senator (Democratic) from Alabama. Black sponsored a number of progressive legislative measures, including the Fair Labor Standards Act (enacted into law in 1938). In 1937 President Franklin Delano Roosevelt appointed him associate justice of the United States Supreme Court.

BLACK, Joseph (1728–99), Scottish chemist, born in Bordeaux, France, and educated at Glasgow and Edinburgh universities. He was professor of chemistry, medicine, and anatomy at Glasgow University from 1756 to 1766; thereafter he was professor of chemistry at Edinburgh University. Black discovered the phenomenon of latent heat about 1761, and measured the latent heat of steam in 1764; his pupil and assistant James Watt later put these discoveries to practical use. Black discovered the gas, carbon dioxide, which he called fixed air, about 1754, and showed its function in the "causticization of lime", thus helping to disprove the phlogiston (q.v.) theory; see Chemistry: *Rise of Modern Chemistry*. He discovered also that different substances have different specific heats. Among his works are *Experiments on Magnesia, Quicklime, and Other Alkaline Substances* (1756) and *Lectures on the Elements of Chemistry* (2 vols., posthumously published, 1803).

BLACK AND TANS, members of an auxiliary force of constabulary serving in Ireland during the disturbances of 1920–21 (see Ireland, Republic of: *History*), so called from the colors of their uniform. Recruited in England from unemployed veterans of World War I to carry on a ruthless campaign of counterterrorism against the Irish revolutionaries, the Black and Tans actually aided, in effect, the cause of Irish independence, by uniting the general population of southern Ireland against British rule. Their tactics also aroused public opinion throughout England, which influenced the British government to grant dominion status to the Irish Free State in 1921.

BLACK AND TAN TERRIER. See Manchester Terrier.

BLACK ASH. See Soda.

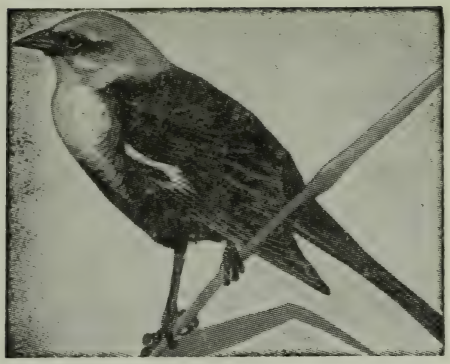
BLACK BASS. See Bass.

BLACK BEER. See Spruce Beer.

BLACK BEETLE, name commonly but erroneously applied to the Oriental cockroach (see Cockroach).

BLACKBERRY, common name for the fruit of plants of the genus *Rubus*, subgenus *Eubatus*, in the Rose family. The ripe fruit is an aggregate of small, purplish-black drupes attached to a cone-shaped *receptacle*, which

Blackberries (Rubus allegheniensis)



Yellow-headed blackbird (family Icteridae)

readily separates from the plant when the berries are picked. In other subgenera of *Rubus*, the receptacle separates from the drupes and remains on the plant; see RASPBERRY. More than twenty-four species of blackberry are recognized, including several called dewberry (q.v.) and albino varieties called white blackberry. The commonest species are the English *R. fruticosis*, and the American *R. allegheniensis*. See BRAMBLE; RUBUS. Although it was highly developed in the wild state, the blackberry was rarely grown as a garden fruit until about 1850. Since then it has been widely cultivated, and has become an important commercial crop; more than 30,000,000 quarts are picked annually in the United States for marketing and canning.

BLACKBIRD, common name for birds of the Blackbird family (q.v.), the Icteridae. It is applied also to several birds of other families, especially the merle, the lark bunting, and the ani.

BLACKBIRD FAMILY, common name for the family Icteridae, in the order Passeriformes. About 240 species are known, all native to the Americas. In most species the plumage of the adult male is predominantly black: the females and young are dull in color. All members of the family have sharp, stout, cone-shaped bills with cutting edges, and have nine primary feathers in each wing and twelve feathers in the tail. Among the best known birds in the family are the bobolink, cowbird, grackle, meadow lark, and oriole (qq.v.).

BLACK BUCK, common name for an antelope, *Antilope cervicapra*, of India and Assam. Adult males are about 32 inches in height at the shoulder, and 85 pounds in weight. Their ringed horns have a spiral twist of three to four turns, and range from 16 to 28 inches in length. The upper parts of young males are dark brown, and become black as the buck grows older; the under parts and a ring about the eyes are white. Does are usually hornless and are yellowish brown in color. Black bucks frequent open plains, and travel in large herds; hunting them with greyhounds, cheetahs, or falcons is a sport of many parts of India.

The name "black buck" has also been applied to an African antelope, the sable antelope (q.v.), which is related to the oryx and gemsbok.

BLACKBURN, municipal and county borough of Lancashire, England, about 23 miles N.N.W. of Manchester. It is the chief cotton-weaving center in the United Kingdom. Other leading industries include the manufacture of textile machinery and iron. The surrounding region contains coal mines and limestone quarries. Among the city's noteworthy edifices are St. Mary's Cathedral, Draper's Hall, and the Town Hall. Blackburn Grammar School, housed in buildings constructed in 1884, was founded by Queen Elizabeth in 1567. The city is also the site of a free school for girls, founded in 1765. In Elizabethan times Blackburn was a thriving market town. It later became a center of handicraft clothmaking, and was known especially for a fabric called "Blackburn greys". The English mechanic James Hargreaves, reputed inventor of the spinning jenny, was born near Blackburn. Pop. (1953 est.) 109,200.

BLACK CANYON OF THE GUNNISON NATIONAL MONUMENT, national monument of the United States, situated in Montrose Co., Colo. Established by the Federal government in 1933 and occupying 13,176.02 acres, it contains the most picturesque section of Black Canyon, the gorge of the Gunnison R. This section of the gorge is 10 m. long and 1750 ft. deep. Its maximum width between rims is 1300 ft.; at a number of points along the river bed its width is only 40 ft. Strata of the Archean era, the oldest in geological time, and of various other eras are exposed along the canyon's walls, and the monument is consequently of great geological interest. The name of the canyon was suggested by the coloration of the older strata.

BLACKCAP, common name for any of several small birds having a "cap" of black feathers. **1.** In various parts of the U.S., the chickadee; see TITMOUSE. **2.** Any of several

American gulls, particularly the laughing gull (q.v.). **3.** A European warbler, *Sylvia atricapilla*. **4.** In the U.S., most commonly, Wilson's warbler, *Wilsonia pusilla*, a small, olive and yellow bird with the top of the head, in the male, a rich, lustrous black. Living in swamps and low woodlands, it feeds on insects, and nests in brush near the ground. It summers in N.E. North America as far south as Maine, and winters in Central America and Mexico.

BLACKCOCK, the male of a species of grouse, *Lyrurus* or *Tetrao tetrix*, common on moorlands throughout Europe. It has dark plumage and laterally curved tail feathers. In Great Britain it is known as black grouse, black game, or heath cock; the female, with lighter, barred plumage, is called gray, or brown, hen. See GROUSE.

BLACK DEATH. See PLAGUE.

BLACK DRAFT. See SENNA.

BLACK DUCK, common name for a North American duck, *Anas rubripes*, with dark-brown plumage. The common black duck, found in the United States east of the Mississippi River, has an olive-colored bill and brown feet. Another variety, the red-legged black duck, with yellow bill and red legs, summers in northern Canada and winters in the eastern Gulf States. Both varieties are hunted for sport and food.

See DUCK.

BLACKETT, P(ATRICK) M(AYNARD) S(TUART) (1897–), English physicist, born in London, and educated at Royal Naval College and Cambridge University. He was professor of physics at London University from 1933 to 1937, at the University of Manchester from 1937 to 1953, and again at London University from 1953. During World War II, Blackett developed the method of co-ordinated scientific research known as operations research (q.v.), and served as chief adviser on operational research to the British navy. For his contributions in the fields of nuclear physics and cosmic rays he was awarded the 1948 Nobel Prize in physics. He wrote *Fear, War, and the Bomb* (1949) and *Atomic Weapons and East-West Relations* (1956).

BLACK-EYED SUSAN. See RUDBECKIA.

BLACKFIN, or BLUEFIN, common name for a large whitefish, *Leucichthys nigripinnis*, of the deep waters of Lake Michigan and certain lakes in New York State, distinguished by its blue-black lower fins. See WHITEFISH.

BLACKFISH, common name for any of several fishes of dark color. In the U.S. the name is used generally to refer to the tautog (q.v.). Other "blackfish" are a bass (q.v.), *Centropristes striatus*, and a minnow, *Orthodon microlepidotus*, of the Pacific coast. In England the blackfish or black ruff is a food fish, *Centrolophus niger*, common in deep waters off southern Europe. Whales of the genus *Globicephala* are called blackfish; see CAAING WHALE.

BLACK FLY, any of the small dipterous insects of the genus *Simulium*. The adult is about ¼ inch in length, with black body and transparent wings. Black flies are diurnal in habit and live on blood sucked from men and animals. The eggs are deposited on rocks in swift streams, and the larvae develop in running water. Adult flies first emerge in spring, and several generations are born each summer. The northern, or Adirondack, black fly is a common pest in some woods and mountains of northeastern U.S. A related species of the Mississippi Valley, known as the buffalo gnat, is sometimes a serious pest to cattle. Another species, the turkey gnat of southern U.S., is injurious to poultry.

BLACKFOOT, a closely related confederacy of North American Indian tribes of Algonquian stock, formerly roaming the northern plains region between the upper Missouri and Saskatchewan rivers. The Blackfoot consists of the Siksika or Blackfoot proper, the Kainah or Bloods, and the Piegan. The entire group is known among its members as the Bloods. The Blackfeet were noted buffalo hunters and warriors; except for the growing of tobacco, they did no farming. Their culture and economy were thus essentially typical of those of the Plains Indians (q.v.). In modern times the Blackfeet were settled on Indian reservations in the United States and Canada. In a recent year over 5000 members of the confederacy lived on the largest of these reservations, situated in Montana, U.S.

BLACK FOREST (Ger. *Schwarzwald*), wooded mountain region in the southwestern part of Germany, situated in the West German States of Württemberg-Baden and Baden. The region is about 100 m. long, varies in width from about 14 m. in the N. to 38 m. in the S., and occupies an area of about 1800 sq.m. Its name refers to the heavy stands of fir on the upper slopes, especially above the 2000-ft. level. Below this level are extensive forests of oak and beech. Maximum elevations, situated mainly in the S. portion of the

region, include the Feldberg (4695 ft.), the Herzogenhorn (4610 ft.), and the Belcher (4600 ft.). The highest peak of the northern part is the Hornisgrinde (3790 ft.). Near Altbreisach, in the district of Freiburg, is situated the isolated volcanic mass of the Kaiserstuhl. A number of rivers, including the Danube and the Neckar, rise in the Black Forest, and there are numerous lakes on its east slope. Geologically the region is composed of Archean granites and gneiss, which form its core. Mineral springs are abundant; in the region are such well-known health resorts as Baden-Baden and Wildbad. The upland plains are suitable for farming and cattle raising.

BLACK FRIARS. See DOMINICANS.

BLACK FRIDAY, name applied to two disastrous days in the financial history of the United States. The best known of these incidents occurred on Friday, Sept. 24, 1869, when the American financiers James Fisk and Jay Gould attempted to control the market in gold by purchasing the gold reserves of New York City banks. As the price of gold rose rapidly to an unprecedented level, all exchange markets were thrown into confusion and the prices of commodities listed on the stock exchange fluctuated widely. Toward the close of the business day the markets were stabilized when U.S. Secretary of the Treasury George Sewall Boutwell announced that the Federal government had made $4,000,000 of its gold reserves available for trading. According to historians, Fisk and Gould made a profit of about $11,000,000 by their manipulations. On the second Black Friday, Sept. 19, 1873, a great financial crash took place on the New York Stock Exchange, and was followed by the "panic of 1873".

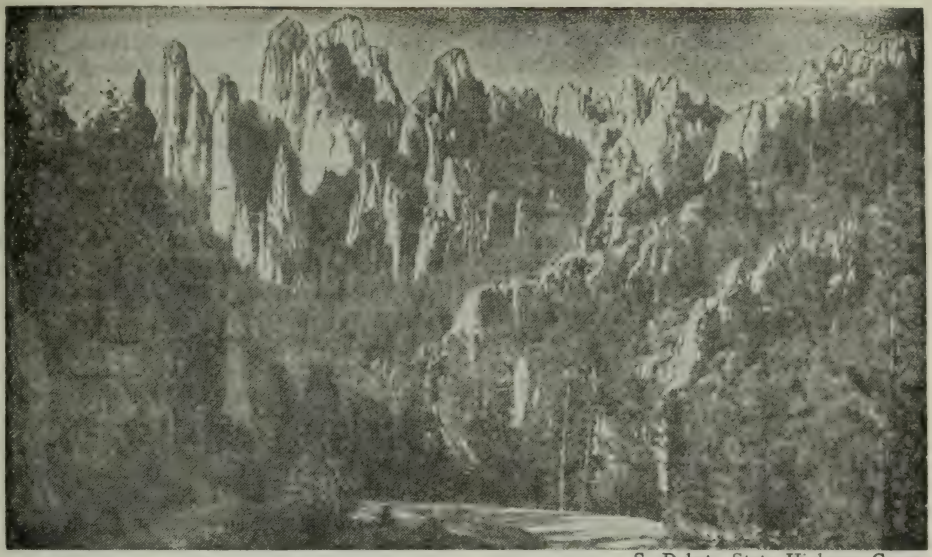
BLACK GUM. See TUPELO.

BLACK HAWK (1767–1838), a celebrated chief of the Sac Indians. In 1804 the Sac and Fox Indians agreed, for an annuity of $1000, to give up to the United States their lands east of the Mississippi River. Black Hawk promptly repudiated this agreement, and during the War of 1812 he and his troops fought against the United States. The cession of the disputed territory was again arranged by treaties signed in 1815 and 1816, and in 1823 the majority of the Sacs and Foxes settled west of the Mississippi. However, when Whites began to occupy the vacated lands, Black Hawk once more refused to recognize the agreement. In June 1831, he led a small force across the Mississippi to attack white settlers, thus precipitating the so-called Black Hawk War. The Indians were defeated near the Wisconsin River on July 21, 1832, and again at the Bad Axe River on August 1–2; Black Hawk surrendered on August 27. The Sacs and Foxes were settled soon afterward on a reservation near Fort Des Moines, Iowa, where Black Hawk died. He wrote *The Autobiography of Black Hawk* (1833).

BLACKHEAD, the scaup duck; see BLUEBILL.

BLACK HILLS, mountainous region of the United States, situated in northeastern Wyoming and western South Dakota. The average elevation of the region, which occupies an area of about 6000 sq.m., is about 4000 ft. Harney Peak (7242 ft.) is the highest summit. To the N.E. of Harney Peak is Mount Rushmore (6040 ft.), site of Mount Rushmore National Memorial (q.v.). The region is drained by the Belle Fourche R. and by the South Fork of the Cheyenne R. On the slopes of the Black Hills are heavy stands of timber, mainly conifers. Nearly 1900 sq.m. of the forested areas are preserved as a national forest. The region is one of the richest gold-mining districts in the United States and contains a wide variety of other mineral resources, including silver, lead, copper, tin, iron, coal, petroleum, salt, mica, and gypsum.

BLACK HOLE, designation commonly given to a dungeon or dark cell in a prison. As originally used, the term referred to a small chamber in the Calcutta stronghold of the British East India Company, known as Fort William, which was captured by native insurrectionists under the leadership of Siraj-ud-daula, Nawab of Bengal, on June 20, 1756. According to an account of the incident written in 1758 by a leading official of the East India Company, the British garrison, totaling 146 men, was confined in a cell 18 ft. by 14 ft. 10 in., with only two small windows; after a night of agony from pressure, heat, and thirst, only 23 prisoners survived. However, the facts in the case were never established. No official report of the alleged atrocity was made to the home office of the East India Company, and the fact that no retaliatory measures were taken by the commander of the British forces in India indicates that the official's narrative was fictitious. Indian and English investigators were unable to discover evidence in support of the official's account. Their findings indicate that 114 men were killed defending the fort, that 9 of the garrison's officers were confined in the small room after the battle, and that



S. Dakota State Highway Comm.

The picturesque Cathedral Spires in Custer State Park, Black Hills of South Dakota

during the night 3 of the officers died, 2 of them from wounds.

BLACK HORSE, or MISSOURI SUCKER, common name for a small, jet-black, food fish, *Cycleptus elongatus*, found in the rivers of the Mississippi valley. It has a small head and narrow body, and is about 2 ft. in length.

BLACK LEAD. See GRAPHITE.

BLACKLEG, BLACK QUARTER, or SYMPTOMATIC ANTHRAX, infectious disease of farm animals characterized by subcutaneous swellings, especially on the legs, and caused by a bacillus, *Clostridium chauvei*. It is confined almost entirely to cattle, but has occurred in sheep, goats, camels, pigs, and horses. Blackleg was until recent years generally confused with anthrax or malignant edema. The disease runs its course very rapidly and is fatal in nearly all cases. Cattle between the ages of six months and four years are most susceptible. In many cases infection takes place through wounds, but more frequently results from the consumption of infected feed or drinking water. Blackleg is found in nearly all countries of the world.

BLACK LETTER, in the United States, Canada, and Great Britain, a printing type, generally know on the continent of Europe as *Gothic*. The first printed books indicated every peculiarity of contemporary manuscripts, and, as printing was first practiced in Germany and the Netherlands, in the middle of the 15th century, the first types were copies of the letters then in use in those countries. The Gothic style dates from about the middle of the 12th century; the type designed in imitation of its handwritten characters, first used about 1445, spread with the art of printing into most European countries, until the classical taste reverted to the more graceful letter known as Roman. Roman type is a revival of what is known in paleography as the Caroline minuscule, of the kind used in the 11th and 12th centuries. The Italian printer Aldus Manutius in 1501 attempted to supersede the Roman letters with letters once called Aldine or Venetian, but now best known as italic characters. These did not achieve more than temporary or exceptional use, but the Roman letters were adopted throughout western Europe. Although supplanted in general use, the Gothic or Black Letter was retained for special purposes such as the printing of Bibles, prayer books, and proclamations.

This line is in black letter.

BLACKMAIL, in law in Great Britain and the United States, the criminal offense of attempting to extort money or property by threats or accusations of various kinds. It is distinguished from extortion in its widest sense, which includes the use of any means of illegal compulsion or oppressive exaction.

As a rule, it is no defense to the charge of blackmailing that the person threatened with exposure of criminal or shameful conduct is guilty of the offenses imputed to him, nor that the attempt at extortion was not successful. The criminality of the offense consists in its tendency to induce a breach of the peace, and in some cases to pervert justice. Under some statutes only written threats made for the purpose of blackmail are punishable criminally, but in most of the States, and in England, the offense is a criminal one whether the threats are made orally or in writing.

BLACK MARKET, term designating the widespread illicit sale of commodities and currencies. The term originated in Europe during World War I; its use in the U.S. in connection with breaches of government regulations as to sales of essential commodities dates from World War II.

When commodities are scarce a government may resort to rationing and price fixing to control the distribution of the available supply. Thus an opportunity is created to make extraordinary profits by the circumvention or violation of government regulations. Black-market operations in the United States from 1941 to 1947 involved commodities of a value estimated at hundreds of millions of dollars.

Black markets in currency exchanges develop when a state fixes the rates at which its currency may be exchanged for those of other countries (see EXCHANGE, FOREIGN), to obviate, offset, or control the economic consequences of unfavorable trade balances, or of disturbed internal political conditions threatening social stability. Inasmuch as such fixed rates of exchange do not reflect the true relationship of the country adopting them to the world market, an incentive is created for holders of foreign currencies to realize greater profits in extralegal currency exchanges than in exchanges at official rates.

No government has been able entirely to stamp out a black market. Punishment of black-market operators, no matter how severe, has proved insufficient to eliminate the evil. Being essentially a partial displacement of the exchange of commodities from natural economic channels, the black market can be eliminated only by restoring the sale of the commodities involved to those channels. Thus the black market in the United States began with inception of rationing and price control in 1941–42, during World War II, and virtually vanished with the end of rationing and price control of most essential commodities in 1947.

BLACK MONDAY, name used for any Monday marked by memorable disaster. It is most frequently applied to three Easter Monday events. These were the massacre of some five hundred English settlers in Dublin, Ireland, by Irish natives (1209); a hailstorm in England (1351); and a day of extraordinary darkness and stormy weather near Paris, France, during which many men and horses in the army of King Edward III of England died of exposure and cold in the midst of a campaign against the French (1360).

BLACKMORE, RICHARD DODDRIDGE (1825–1900), English novelist, born in Longworth, Berkshire, and educated at Oxford University. He wrote several volumes of poetry before the publication of his first novel *Clara Vaughn* (1864). His reputation was established by *Lorna Doone* (1869), a historical novel laid in the 17th century which remains his best-known and most popular work. Among Blackmore's other writings are the novels *Cradock Nowell* (1866), *Alice Lorraine* (1875), *Springhaven* (1887), and *Dariel* (1897).

BLACK MOUNTAINS, range of the Alleghenies, forming the culminating mountain group of the Appalachian system. The Black Mountains lie mainly in Yancey and Buncombe counties, western North Carolina, and are so called because of the dark growth of evergreens covering their summits. The highest peak, Mount Mitchell (6684 ft.), in Yancey County, is the highest point in the State. A number of other peaks are more than 6500 ft. in height.

BLACKPOOL, county borough and vacation resort of Lancashire, England, situated on the coast of the Irish Sea, about 30 miles N. of Liverpool. Recreational facilities include an excellent bathing beach, a number of promenades and esplanades, several piers, a winter garden and pavilion, an amusement park, and an aquarium. The city is visited by several million vacationists annually. Branch railways connect Blackpool with Liverpool, Manchester, Preston, and other cities. Pop. (1953 est.) 146,700.

BLACK PRINCE, See EDWARD, the Black Prince.

BLACK QUARTER, See BLACKLEG.

BLACK RACER. See BLACKSNAKE.

BLACK RIVER, name of a number of rivers of the United States. **1.** A river, known also as the BIG BLACK RIVER, rising in southeastern Missouri and flowing in a southeasterly direction to a point near the State border.

There it turns S.W. and flows through Arkansas, joining the White R. above Newport, Jackson Co. It is the largest affluent of the White R., with a total length of about 400 m. The river is navigable for about 100 m. from its mouth, except during the dry season. A Black R. flood control project, including Clearwater Dam (4425 ft. long and 143 ft. high) was completed in 1948; it is situated about 6 miles S.W. of Piedmont, Mo. **2.** A river, nearly 200 m. long, rising in the southwestern Adirondacks, in New York State. It flows in a general northerly direction for the greater part of its length, and then turns westward and empties into Black River Bay, the extreme eastern end of Lake Ontario. Numerous falls and rapids furnish abundant water power to Watertown, N.Y., and other localities. From Lyons Falls to the mouth of the river, about 72 m., the fall is about 500 ft. **3.** A river, about 200 m. long, rising in Taylor Co., Wisconsin, and flowing in a general southwesterly direction. It joins the Mississippi R. at La Crosse, Wis. **4.** A river of Windsor Co., Vermont, flowing into the Connecticut R. It furnishes abundant water power to the towns along its banks. **5.** A river of eastern South Carolina, about 150 m. long. It rises in Lee County and flows in a general southeasterly direction, entering the Waccamaw R. near Georgetown.

BLACK ROOD OF SCOTLAND, an ebony crucifix believed to contain a portion of the cross upon which Jesus Christ was crucified. The relic was brought to Scotland about 1070 by Margaret, wife of King Malcolm, and was held in the highest veneration by the Scottish kings. It fell into the hands of the English during the invasion of England by David II of Scotland in 1346, and was installed in the cathedral at Durham. The relic disappeared during the period of unrest which accompanied the introduction of the Reformation into England during the 16th century.

BLACK ROT. See GRAPE.

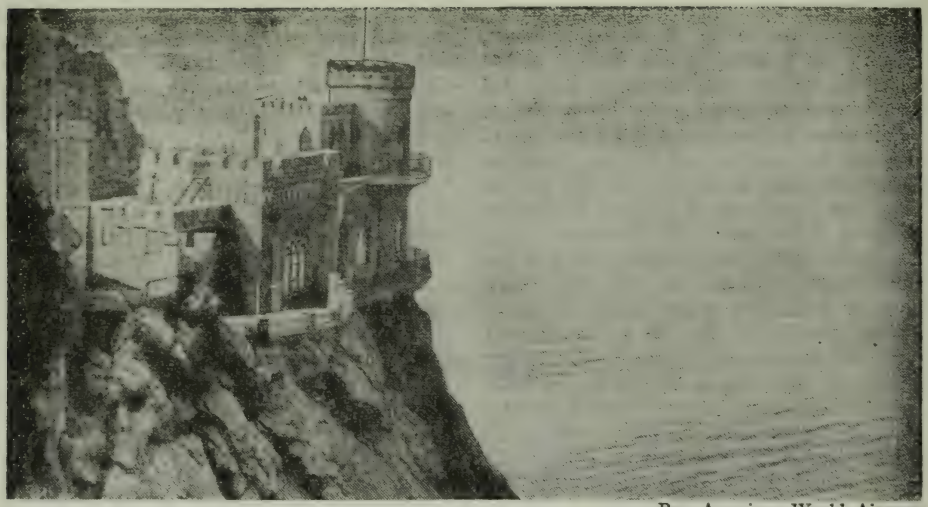
BLACK SALSIFY. See SCORZONERA.

BLACK SEA, or EUXINE SEA (Russ. *Chernoe More*; anc. *Pontus* or *Pontus Euxinus*), inland sea lying between eastern Europe and Asia Minor, and connected with the Ægean Sea by the Bosporus, the Sea of Marmara, and the Dardanelles. Turkey in Europe, Bulgaria, and Romania bound it on the W. as far as the mouth of the Danube R. The northern and eastern shores are Soviet territory and the entire southern shore is Turkish territory.

The Black Sea has a length of about 750 m. from E. to W., a maximum width of 380 m., and an area (excluding its N. arm, the Sea of Azov) of about 165,000 sq.m. The Crimean Peninsula projects into the Black Sea from the north, forming the shallow Sea of Azov and the Gulf of Perekop. The former is almost entirely cut off from the Black Sea, which receives the drainage of a large part of central Europe through the Dnieper, Dniester, Bug, and Danube rivers; of a considerable section of eastern Russia, through the Don R. (which flows into the Sea of Azov); of the western Caucasus region through the Kuban and a number of smaller rivers; and of northern Asia Minor through the Chorukh, Yeshil Irmak, Kizil Irmak, and Sakarya rivers. The floor of its single central basin lies 6000 ft. below the surface and the greatest depth exceeds 7000 ft. Owing to the presence of hydrogen sulfide no sea life is found below 80 fathoms. There is a strong current flowing toward the Bosporus, and an undercurrent flowing in an opposite direction from the Ægean Sea. The Ægean current is saline and is mainly responsible for the fact that the waters of the Black Sea contain nearly 2 percent of salt. Severe storms occur frequently on the sea, particularly during the winter season. The prevailing winter winds are northerly.

The Black Sea is abundantly stocked with valuable sturgeon and other fish. As an outlet for the products of the Ukraine and adjoining regions, it is of special importance in Soviet commerce. The principal ports on the Black Sea are Odessa, Poti, Batumi, Kherson, Sevastopol, and Novorossisk in Soviet territory, Constanta in Romania, Burgas and Varna in Bulgaria, and Samsun, Sinop, and Trabzon (Trebizond) in Turkey.

Navigated from a very early period, the sea was known originally as *Pontos Axeinos* (Gr., "inhospitable sea"), afterward changed euphemistically to *Pontos Euxeinos* ("hospitable sea"). There are many references to the sea in Greek mythology, especially in the stories dealing with the exploits of the mythical hero Jason during his search for the Golden Fleece. Many of the colonial and commercial activities of ancient Greece and Rome, and in later times of the Byzantine Empire, centered around the Black Sea. For almost three centuries after 1453, when the Turks occupied Constantinople (modern Istanbul), capital and last stronghold of the Byzantine Empire, the sea was virtually closed to foreign commerce. The Russian Empire began to challenge Turkish supremacy in the



Pan American World Airways

Castle on the rocky coast of the Crimean Peninsula, overlooking the Black Sea

Black Sea early in the 18th century. Following the Turkish defeat in the Russo-Turkish War of 1768–74 the Russians gained important rights for their Black Sea commerce. By the terms of the Treaty of Paris (1856), which ended the Crimean War (q.v.), the sea was opened to the commerce of all nations and was neutralized. In 1870 Alexander II of Russia repudiated the neutralization section of the Treaty of Paris and placed a naval force in the Black Sea. A conference (1871) of European powers, held in London, countenanced this action but reaffirmed the right of the Turkish sultan to close the Dardanelles and the Bosporus to war vessels. During World War I the Russian fleet in the Black Sea was active against Turkey. Little naval action took place on the sea during World War II. With regard to traditional Russian ambitions for control of the outlet from the Black Sea to the Mediterranean Sea, see DARDANELLES.

BLACK SHIRT, garment worn as part of the uniform or dress of various organized groups, often military; also, the name applied to a member of such a group. The most widespread official wearing of black shirts in recent times was by members of the Fascist Party in Italy, which, under the Italian Fascist leader Benito Mussolini, ruled that country from 1922 to 1943. Group wearing of black shirts dates from the 7th century, when black was the color of the flag and all wearing apparel of the Mohammedan dynasty of the Abbassides (q.v.). In the 16th century several companies of French infantry campaigning in Italy were distinguished by their black tunics. Some time later a regiment of German lansquenets, or foot soldiers, who wore black shirts, was part of a French army in an Italian campaign. In 1702 French Protestant peasants of the Cévennes Mountains, led by the French soldier Jean Cavalier, revolted against the authority of King Louis XIV because of religious persecution. Black shirts formed the distinctive part of their dress, and they were known therefore as *Camisards Noirs* or Black Shirts. See CAMISARDS.

BLACK SILVER. See STEPHANITE.

BLACKSNAKE, common name for any snake predominantly black in color, particularly two nonpoisonous snakes of the United States. **1.** *Coluber constrictor*, the common blacksnake or black racer, is common throughout eastern U.S. The adult attains a length of 6 feet, and is uniformly black, with smooth scales of satiny luster. Small warm- and cold-blooded animals constitute its prey, and it swallows them alive. The blue racer, a variety of this species common west of the Mississippi R., is bluish green above and yellow beneath. **2.** *Elaphe obsoleta*, the pilot blacksnake, mountain blacksnake, or black chicken snake, is found in the eastern U.S. Growing to 8 feet or more in length, it is black above and white or gray beneath, with glossy, keeled scales. Small, warm-blooded animals are its only food, and it kills them by constriction. In some localities this snake is incorrectly regarded as a chicken killer, be-

cause it is often found near chicken coops in search of rats.

BLACK SNAKEROOT. See CIMICIFUGA.

BLACKSTONE, SIR WILLIAM (1723–80), English jurist and legal scholar, born in London, and educated at Oxford University. From 1758 to 1766 he was professor of English law at Oxford University. In 1770 he was appointed a justice of the Court of King's Bench, and shortly thereafter a justice of the Court of Common Pleas; he spent the remainder of his life in the discharge of his judicial duties and in activity for the reform of the inhuman prison system of his day. Blackstone's most important work, the *Commentaries on the Laws of England* (4 vols., 1765–69), was used for over a century as the foundation of all legal education in England and the United States. At the present time, however, the *Commentaries* are esteemed chiefly as a comprehensive history of English law.

BLACK STONE OF MECCA, Mohammedan sacred stone, preserved in the Kaaba, Moslem holy place at Mecca, in Saudi Arabia. According to legend it was given by the angel Gabriel to the Jewish patriarch Abraham and was originally white, but became blackened in consequence of the sins of mankind. The stone is probably a meteorite.

BLACK-TAILED DEER, common name for a species of deer, *Odocoileus columbianus*, found in the Pacific coast region between Alaska and southern California. It is called the Columbia blacktail to distinguish it from the mule deer (q.v.), a related species found in the same range. In appearance it is similar to the mule deer, but is considerably smaller; the tail is longer, and is dark above and white beneath. The Crook black-tailed deer, *O. crooki*, is a similar species found in Arizona and New Mexico.

BLACKTHORN. See SLOE.

BLACK VOMIT. See YELLOW FEVER.

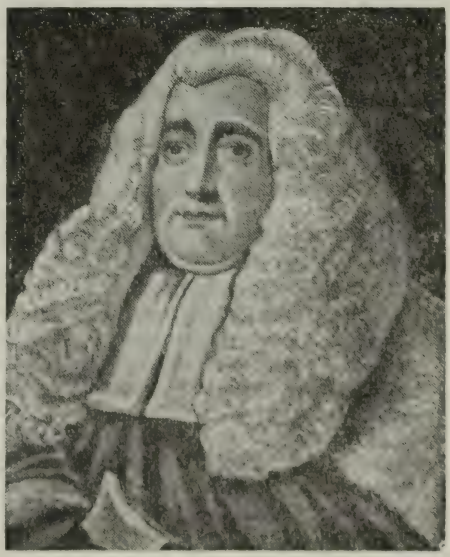
BLACK WALNUT. See WALNUT.

BLACK WATCH or, officially, **ROYAL HIGHLANDERS,** famous Scottish infantry regiment, organized by the British army in 1729. Its component units, several companies of militia, were formed by the British government in 1688 and given the duty of curbing fratricidal strife among the clans of the Scottish highlands. Unlike British regulars, whose uniforms included scarlet breeches and coats, the militiamen wore kilts and dark-colored tartans. When absorbed by the regular army the Black Watch troops were allowed to retain their traditional dress and name. The regiment was designated the "42nd" or "Highland" Regiment in 1751. In 1767, after nearly twenty years of service in North America, it was renamed "Royal Highlanders", but use of the original title was authorized.

BLACKWATER. See TEXAS FEVER.

BLACKWELL, ELIZABETH (1821–1910) and her sister EMILY (1826–1910), American physicians, both born in Bristol, England, and educated in medicine: Elizabeth, at the Geneva Medical School of Western New York, and the hospitals of London, England and Paris, France; Emily at Bellevue Hospital, New York City, Western Reserve University, and the hospitals of Edinburgh, Scotland, and Paris. They were pioneers in the practice of medicine by women, and Elizabeth was the first woman of modern times to receive (1849) the degree of Doctor of Medicine.

The sisters founded in New York City in 1853 the New York Infirmary for Women and Children; this institution had a medical staff consisting solely of women physicians, and was the first such institution ever founded. A medical college for women, added in 1868, was affiliated with the Cornell University Medical College when the latter institution was established in New York City in 1898. Elizabeth Blackwell lived in London after 1869. She was one of the founders of the National Health Society of London and the London School of Medicine for Women; in the latter she was professor of gynecology from 1875 to 1907. Among her writings are *The*



Sir William Blackstone, English jurist

James G. Blaine

Physical Education of Girls (1852) and *Pioneer Work in Opening the Medical Profession to Women* (1895).

BLACKWELLS ISLAND. See WELFARE ISLAND.

BLACK WIDOW, common name for a poisonous spider, the female of the species *Latrodectus mactans* in the family Theridiidae. Found chiefly in the tropics, it is also common in the southern States of the U.S., and is occasionally found as far north as New England. The body of the black widow is about ½ inch in length, and jet black in color, with a red mark, shaped like an hourglass, on the underside of the abdomen. Males of the species are smaller, harmless, and rarely seen. The female devours the male immediately after mating, thus giving rise to its common name. The black widow is the only spider found in the U.S. whose bite is dangerous to man, and probably is the most poisonous spider extant. Its bite is followed by local pain and swelling, nausea, and difficulty in breathing, and is sometimes fatal.

BLADDERWORT, common name for plants of the family Lentibulariaceae, in the order Polemoniales. The most widespread genus is *Utricularia*, containing about 275 species found in temperate and tropical regions throughout the world. Species of this genus grow in a wide variety of habitats, some being aquatic and others terrestrial. A number of tropical species are air plants, resembling orchids, and are sometimes cultivated in greenhouses. Among the aquatics, some root in the mud and others, such as *U. vulgaris*, the common bladderwort, are rootless, floating freely in ponds. The common and scientific names of the genus refer to the numerous *utricles*, or bladders, ranging from 1/25 to 1/5 of an inch in diameter, borne on the leaves of *U. vulgaris*.

Each of the bladders of the common bladderwort has an orifice guarded by bristles; when tiny aquatic insects or other animals, including even minute fish, touch these bristles, the bladder suddenly dilates, sucking in and trapping the animal. From the decomposition of the bodies of the entrapped animals the bladderwort obtains the nitrogenous food which it cannot obtain through a root system. The bladders are believed by some botanists to serve an additional purpose, becoming filled with air at the time of flowering and thus raising the flowerstalk above the surface of the water.

Among other plants in the family are *Vesiculina purpurea*, the purple bladderwort, common in ponds in Eastern U.S., and various species of *Stomosia* and *Pinguicula*, none of which are aquatic.

BLAGOVESHCHENSK, city of Khabarovsk Territory, Soviet Russia, on the E. bank of the Amur R., at its junction with the Zeya R. on the Manchurian border. The Chinese Changchun (formerly Chinese Eastern) Railway of Manchuria crosses the Amur R. into Soviet territory at Blagoveshchensk, connecting 70 miles to the N.E. with the Trans-Siberian Railway. The city is an important river port and commercial center, with an extensive trade in tea, grain, and cattle. Pop. (1939) 58,761.

BLAINE, JAMES GILLESPIE (1830–93), American statesman, born in Brownsville, Pa., and educated at Washington College, Washington, Pa. Blaine was a teacher in Georgetown, Ky. and in Philadelphia, Pa., successively, between 1848 and 1854. In the latter year he moved to Augusta, Me. He became prominent in political circles in Maine and in 1859 was elected to the State legislature as a Republican, serving until 1862. From 1862 to 1876 he was a member of the U.S. House of Representatives and from 1869 to 1875 he was speaker of the House. During his career as a Congressman he vigorously supported the administration of President Abraham Lincoln, and succeeded in modifying some of the most radical measures proposed by the American statesman Thaddeus Stevens at the time of the Reconstruction (q.v.). After his election to the United States Senate in 1876, Blaine opposed the Bland-Allison Act (see BIMETALLISM), supported ship subsidies, voted

against unrestricted Chinese immigration, and favored a high protective tariff.

Blaine was a candidate for the Presidential nomination at the Republican convention of 1876, but was defeated by Rutherford Hayes by a small majority. In 1881 President James Garfield appointed Blaine Secretary of State. After the assassination of Garfield later in 1881, Vice-President Chester Alan Arthur became President. Arthur was under the influence of the American politician Roscoe Conkling, a political enemy of Blaine, and Blaine resigned his office in December.

At the Republican convention of 1884 Blaine won the nomination for President; the Democratic candidate was Grover Cleveland. The Blaine-Cleveland campaign was one of the most fiercely contested in the history of the country. Blaine lost the election; according to many historians the major factors in his defeat were the opposition of Conkling within the Republican Party, the failure of independent Republican voters to support him, and the consequences of a speech made in his behalf by the American Protestant clergyman Samuel Dickinson Burchard, who attacked the Democratic Party as "the party of Rum, Romanism, and Rebellion". Though Blaine himself did not oppose Roman Catholicism (his own sister was mother superior of a convent), the fact that he had permitted this phrase to be used in his presence convinced many people that the Republican Party was anti-Catholic, and caused Blaine to lose many votes.

In 1889 President Benjamin Harrison appointed Blaine secretary of state. As secretary, Blaine secured a favorable treaty with Germany dealing with the control of the Samoan Islands, assembled and presided over the first of the Pan-American conferences (q.v.), and engaged in a controversy with British diplomats over the Bering Sea fisheries (see BERING SEA CONTROVERSY). In 1892 Blaine's relations with the President became strained, and in June of that year Blaine resigned from the cabinet. His name was presented to the Republican convention of 1892, but the convention renominated Harrison.

BLAIR, FRANCIS PRESTON (1791–1876), American journalist and politician, born in Abingdon, Va., and educated at Transylvania University (now Transylvania College). In 1828 he supported the Democratic candidate, Andrew Jackson, for the Presidency; after the election Blair became a member of the group of Jackson's intimate advisers known as the "kitchen cabinet" (q.v.). He established and was the editor (1830–49) of the *Washington Globe*, the most influential Democratic newspaper in the United States during the following decade. Because of his antislavery convictions, Blair left the Democratic Party and became one of the founders of the antislavery Republican Party. He presided over its first national convention in 1856, and in 1860 supported Abraham Lincoln for the Presidential nomination. In December, 1864, with the consent of Abraham Lincoln, he conducted private negotiations with Jefferson Davis, President of the Confederacy, in an attempt to end the Civil War. Their informal communications led to the Hampton Roads Conference (q.v.), an inconclusive discussion of peace terms held in February of the following year. During the Presidency of Andrew Johnson, Blair's opposition to the Reconstruction (q.v.) measures of the Republican administration caused him to rejoin the Democratic Party.

BLAIR, MONTGOMERY (1813–83), American lawyer and public official, born in Franklin Co., Ky., and educated in law. Blair was mayor of St. Louis, Mo., in 1842–43, and a judge of the court of common pleas of that city from 1843 to 1849. He was counsel in several notable cases, including the Dred Scott case (q.v.), in which he was chief counsel for the defense, and became chairman of the Maryland Republican Convention of 1860. Blair was postmaster general of the United States during President Abraham Lincoln's administration, and introduced many improvements in the postal system during his term of office, notably the use of money orders, free delivery in urban areas, and the practice of sorting mail on its way to its destination in special postal railroad cars. He resigned as postmaster general in 1864. Subsequently he became a supporter of the Democratic Party.

BLAISE. See BLASIUS.

BLAKE, EUGENE MAURICE (1882–), American physician, born in Bridgeport, Conn., and educated at Yale University. He became instructor in ophthalmology at the Yale University School of Medicine in 1911, and clinical professor of ophthalmology in 1923. Member of many scientific societies, he was president of the New York Ophthalmological Society in 1945 and 1946, and of the American Ophthalmological Society in 1946; he was also a governor of the American College of Surgeons and a director of the National Society for the Prevention of Blindness and of the Ophthalmological

Foundation. He contributed numerous articles and monographs to medical journals, text books, and encyclopedias.

BLAKE, Francis Gilman (1887–1952), American physician, born in Mansfield Valley, Pa., and educated at Dartmouth College and Harvard University. After serving as U.S. Army medical officer in World War I, he was appointed to the staff of the Rockefeller Institute for Medical Research. In 1921 he became professor of medicine at the Yale University Medical School; he also served as dean of the Medical School from 1940 to 1947. During World War II he was chairman of the Epidemiological Board of the U.S. Army, and was awarded the Medal of Merit and the Army Typhus Commission Award for his work on typhus and related diseases. An authority on chemotherapy and antibiotics, Blake directed preliminary clinical testing of sulfa drugs and penicillin. Among his works are *Chemotherapy of Pneumonia* (1939), *Penicillin Therapy* (1943), and *Tsutsugamushi Disease in New Guinea* (1945).

BLAKE, Robert (1599–1657), English admiral, born in Bridgewater, and educated at Oxford University. In the Civil War between Parliamentarians and Royalists, he commanded the Parliamentary fleet which defeated and sank (1650) most of the Royalist fleet in the Mediterranean Sea. In 1652 and 1653, during the naval war brought on by British economic restrictions aimed at Dutch trade, Blake commanded British forces which won a series of notable victories over the Dutch navy, including a fleet commanded by the famous Dutch admiral Maarten Harpertszoon Tromp. These victories led to the breaking of Dutch naval supremacy. In 1657, during a war with Spain over British seizure of Jamaica, West Indies, Blake won a notable victory over the Spanish West Indian fleet off Santa Cruz de Tenerife in the Canary Islands.

BLAKE, William (1757–1827), English poet and artist, born in London, and largely self-trained. He began writing poetry at the age of twelve, and at fourteen was apprenticed to a London engraver by his father. Blake began to earn his living as an engraver at the age of twenty-one, and for the remainder of his life he supported himself mainly by illustrating books. His first literary work, *Poetic Sketches* (1783), is a collection of verse written before his twenty-first year. In his mature literary and artistic work he is concerned principally with describing and interpreting visions which he claimed to have experienced of God, Jesus Christ, angels, and the spirits of great men of earlier times. Thus, his engravings, book illustrations, and paintings are characterized by the elimination of realistic detail and the infusion of his supernatural subject matter with intense, mystical emotion. His early poetry is notable for great purity and simplicity of diction, and for naïve, almost childlike eloquence; in his mature work, these lyrical qualities give way to power and grandeur, designed to express his complex personal theology.

Among Blake's notable color prints and water colors are "The Day of Judgment", "Nebuchadnezzar", etchings for his symbolic poem *Jerusalem*, and water colors to illustrate the Old Testament Book of Job. Among his poetic works are *Songs of Innocence* (1789), *Songs of Experience* (1794), and the *Prophetic Books*, a series of volumes published between 1793 and 1804, in which he described a new system of Christianity revealed to him in his visions. A prose work, *The Marriage of Heaven and Hell*, also belongs to the last-named group. Blake died in obscurity and poverty, but time has brought a heightened appreciation of both his poetry and his graphic art.

BLAKELOCK, Ralph Albert (1847–1919), American painter, born in New York City, educated at the College of the City of New York, and largely self-trained. Blakelock is best known for his paintings of forest scenes and primitive American Indian life, and is now considered one of the foremost American landscape painters. His work was not appreciated during his early career, however, and brought meager financial returns. From 1901 to 1916 he was confined for insanity, brought about partly by his economic struggles and artistic disappointments. During this period, however, his reputation steadily increased, and collectors and museums now pay large sums for his work. Among his paintings are "Sunset" (National Gallery of Art, Washington, D.C.), "Colorado Plains" (Corcoran Gallery, Washington, D.C.), "Brook by Moonlight" (Toledo Art Museum), and "Pipe Dance" (Metropolitan Museum of Art, New York City).

BLAMEY, Sir Thomas Albert (1884–1951), Australian soldier, born in Wagga, New South Wales. In 1914 he became a member of the general staff of the Australian Imperial Forces. During World War I he served on the Turkish front and became (1918) brigadier general and chief of staff of the Australian Corps. He was

made chief of staff of the A.I.F. in 1919 and attained (1926) the rank of major general. With the rank of lieutenant general, Blamey commanded the A.I.F. in the Middle East from 1940 to 1942, during World War II, and for part of this period was deputy commander in chief of all British forces in the Middle Eastern area. From 1942 to 1945 he served as commander in chief of the Allied ground forces in the Southwest Pacific.

BLANC, Louis, in full Jean Joseph Charles Louis Blanc (1813–82), French socialist and historian, born in Madrid, Spain, and educated in Paris. He contributed to various political periodicals, and soon became known as a leader among the theoretical socialists of his day. In 1839 he established the magazine *Revue du Progrès* as an organ for his doctrines. In general Blanc's concept of the social order was in conformity with the thinking of other contemporary socialists. He anticipated later theorists, however, in declaring that the workers could solve their problems only by revolutionary action, and in formulating the social principle, later adopted by the German revolutionist Karl Marx, "to each according to his needs, from each according to his abilities". Blanc believed that this principle could be realized in his own time through the creation of "social workshops", i.e., associations of producers financed by the state and controlling the means of production. Because the central role in his social program is assigned to the state, Blanc is now called by many historians the father of state socialism.

In the revolution of 1848 Blanc became a member of the provisional republican government which came to power following the abdication of King Louis Philippe. After the bloody suppression of the uprising of workers of Paris, in June, 1848, however, he was forced to flee for his life, and for a time lived in exile in England. Following the fall of the Second Empire in 1870, Blanc returned to France and was elected a member of the National Assembly in February, 1871, but opposed the more extreme measures adopted by the Paris Commune (see Commune of 1871). He was for many years a member of the Chamber of Deputies. Blanc is the author of *De l'Organisation du Travail* (1840), *Histoire de Dix Ans, 1830–1840* (1841), *Histoire de la Révolution de 1848* (2 vols., 1870–80), and *Questions d'Aujourd'hui et de Demain* (1873–84).

BLANCA PEAK, mountain of s. central Colorado, in the Sangre de Cristo range of the Rocky Mountains, about 8 miles s.s.e. of Great Sand Dunes National Monument. It rises 14,390 ft. above sea level, and is one of the highest mountains in the State.

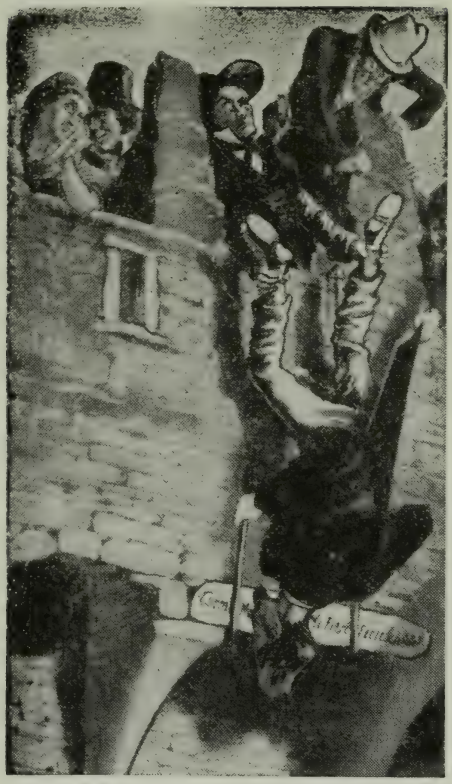
BLANCHARD, Jean Pierre, known also as François Blanchard (1753–1809), French aeronaut. In 1784, a few months after the first balloon ascent, by the French physicist Jean Pilâtre de Rozier (1756–85), Blanchard made a successful ascent in his own balloon. In 1785 he crossed the English Channel by air for the first time (with John Jeffries, an American physician), and in the same year he gave the first successful demonstration of the use of a parachute, dropping a dog in a basket suspended from a parachute. Blanchard visited the United States in 1796, and made his forty-fifth balloon ascent in New York City, the first in America. His wife, Marie Madeline Sophie Armant (1778–1819), took part in the American exhibitions with him. She was killed on her sixty-seventh balloon ascent.

BLANC, MONT (It. *Monte Bianco*), highest mountain (15,781 ft.) of the Alps, situated in Haute-Savoie Department, France, and adjoining the Italian frontier. It forms part of the Savoy range. From the summit to about the 8000-ft. level its slopes are covered by an icecap over 75 ft. thick. On the lower slopes are a number of glaciers, notably Mer de Glace and Taconnaz on the N. and Miage on the S. The first ascent of Mont Blanc was accomplished in 1786 by the French mountain climbers Jacques Balmat and Michel Paccard.

BLANCO, Antonio Guzmán. See Guzmán Blanco.

BLAND, James A. (1854–1911), American Negro minstrel and song writer, born in Flushing, N.Y., and educated at Howard University, Washington, D.C. He gained considerable fame as a minstrel, especially in Great Britain, where he performed from 1882 to 1901. Bland composed several hundred songs, mainly for the minstrel shows in which he appeared. Some of his most famous songs are "Oh, Dem Golden Slippers", "In the Evening by the Moonlight", and "Carry Me Back to Old Virginny".

BLAND, Richard Parks (1835–99), American legislator, born near Hartford, Ky., and educated in law. He began to practice law in Utah in 1860, and after 1873 served as a member (Democratic) of the U.S. House of Representatives from Missouri; he held this office, with an interval of two years, until his death. An ardent advocate of free silver coinage, he introduced in 1878 a bill (Bland-Allison Act)



Kissing the Blarney Stone

providing for the coinage of from $2,000,000 to $4,000,000 worth of silver a month. This bill, which marks an important phase in American monetary policy (see BIMETALLISM), was adopted and continued in force until the Sherman Silver Law, ending this limited coinage, was passed in 1890.

BLANK VERSE, in versification, unrhymed lines, typically containing five feet (or measures), each foot having two syllables, with the accent on the second. Such lines, known technically as unrhymed iambic pentameters, comprise one of the most widely used forms in English poetry. Blank verse is especially effective in narrative poems and verse plays. Its earliest appearance in English literature dates from the first half of the 16th century, when the English poet Henry Howard, Earl of Surrey, used it in his translation of the Latin epic the *Æneid* by the Roman poet Publius Vergilius Maro, known as Vergil. It is used in the plays of the English dramatist Christopher Marlowe, and was perfected by William Shakespeare, principally in his tragedies. Among the greatest blank-verse poems in English literature is John Milton's *Paradise Lost* (1667–74). Outstanding American poets who wrote successfully in the medium include Edwin Arlington Robinson and Robert Frost. See VERSIFICATION.

BLANQUI, LOUIS AUGUSTE (1805–81), French revolutionist, brother of the French economist Jérôme Adolphe Blanqui, born in Puget-Theniers. After studying law and medicine he joined the revolutionary movement in Paris and took an active part in the overthrow (1830) of King Charles X. Blanqui subsequently agitated against the reactionary policies of Charles' successor Louis Philippe. In May, 1839, after helping to organize an unsuccessful insurrection against the government, he was arrested and condemned to life imprisonment. Pardoned early in 1848, he participated in the February Revolution (q.v.) and in the left-wing attempt (May, 1848) to overthrow the newly elected Constitutent Assembly. He received a ten-year prison sentence for his part in the May, 1848, uprising. During his confinement in prison he made an intensive study of socialist political philosophy and originated the theory of the dictatorship of the proletariat, a concept of revolutionary strategy later developed by the Russian communist leader Nikolai Lenin.

Blanqui continued his revolutionary activities after his release (1859) from prison, and in 1861 received a jail sentence of four years on charges of instigating a riot. In 1870 an armed force of revolutionary workers under his command figured decisively in the uprising that led to the establishment of the Third Republic. He and his followers opposed the conservatism of the government of the Third Republic and took part in the insurrection of March, 1871, which resulted in the formation of the Paris Commune (see COMMUNE OF 1871). After the defeat of the Commune he was again sentenced to imprisonment for life, but was released in 1879. His works include *L'Éternité par les Astres* (1872), a treatise on science, and *Critique Sociale* (posthumously published, 1885), a collection of writings on political and economic subjects.

BLARNEY, town of County Cork, Republic of Ireland, situated about 4 miles N.W. of Cork. Textile manufacturing is the chief industry. The town is the site of Blarney Castle, constructed about the middle of the 15th century and containing the so-called Blarney Stone, an inscribed slab near the top of one of the walls. According to legend one who kisses the stone is thereupon endowed with

the gift of eloquence and persuasive flattery. Large numbers of tourists visit Blarney Castle to see and kiss the stone. Pop., (1946) 885.

BLASCO-IBÁÑEZ, VICENTE. See IBÁÑEZ, VICENTE BLASCO.

BLASHFIELD, EDWIN HOWLAND (1848–1936), American painter, born in New York City, educated at the Boston Latin School, and trained under the French painter Leon Bonnat. He is particularly noted for his mural paintings. Among his works are murals in the Library of Congress, Washington, D.C.; at the College of the City of New York; and in the capitol buildings of several States, including Wisconsin and Iowa. In collaboration with his wife he wrote *Italian Cities* (1900–13); his other writings include *Mural Painting in America* (1913).

BLASIUS or **BLAISE,** SAINT (d. 316), early Christian martyr. He was bishop of Sebaste in Cappadocia; when the Roman emperor Licinius began persecution of the Christians, Blasius fled, but was captured by the Roman prefect Agricola. For refusing to deny his faith in Jesus Christ, he was flayed with wool combers' hooks, and finally beheaded. During ancient and medieval times Blasius was widely venerated, and his cultus is still popular. Because he had saved the life of a child choking to death on a fishbone, he is invoked against diseases of the throat, and because of the method of his martyrdom he is regarded as the patron saint of wool combers. In the Roman Catholic Church his feast is celebrated on February 3; in the Orthodox Churches it is February 11.

BLASPHEMY, in the common law, the criminal offense of speaking or publishing words vilifying or ridiculing the divine Being, the Bible, the Church, or the Christian religion. The offense is a misdemeanor and two reasons have been established for considering it a crime: (1) it tends to produce a breach of the peace between the blasphemer and those outraged by his words; and (2) Christianity is a part of common law, and blasphemy tends to subvert the law. The manner rather than the content of the utterance or publication renders it blasphemous; thus, a serious statement of opinion, however heretical, is not punishable as blasphemy. Although blasphemy is still a crime in England and in most of the States of the United States, prosecutions for the offense are now rare.

BLASTING, the use of explosives for the breaking, splitting, or loosening of massive bodies, such as rock, ore, tree stumps, and subsurface clay layers, or for the displacement of dirt or rock in such construction excavations as canals, channels, and foundations. The operation consists of (1) boring or excavating a hole to contain the explosive; (2) charging, or loading the explosive into the blast hole; (3) tamping, or filling the blast hole so as to confine and direct the force of the explosion; and (4) exploding the charge.

The first recorded use of blasting in mining operations dates from 1613, when German miners were reported as using both drilling and blasting. In 1670 blasting was introduced into England, and in 1724 into Sweden. The introduction in 1831 of the uniformly slow-burning "safety fuse" contributed greatly to the safety of blasting operations, and in the same year an American inventor was granted a patent on a method of exploding several blasting charges simultaneously by means of electrically fired blasting caps. In modern blasting practice, multiple charges are initiated by a safety fuse (burning at a rate of about 1 foot per minute) and connected by a detonating fuze (120 feet per second), or by an interconnected set of electric blasting caps fired by a single magneto or blasting machine.

BLATHERSKITE or **RUDDY DUCK,** common name for an American duck, *Erismatura jamaicensis* var. *rubida*. The male is about 15 inches in length, and has black and white head, rich reddish brown back and lighter breast, and brownish black tail of stiff feathers which it carries cocked vertically, like a fan. About the same size, the female is of similar, but duller, color. Blatherskites breed as far north as Hudson Bay, and in winter range southward to the Guianas. In food and nesting habits they resemble other ducks; see DUCK. They have been hunted so extensively for sport and food that they are becoming rare. Other names applied to the blatherskite are "rook", "diver", and "dipper".

BLATTARIAE, BLATTELA, and **BLATTIDAE.** See COCKROACH.

BLAVATSKY, ELENA PETROVNA (1831–91), Russian traveler and theosophist, born in Ekaterinoslav (now Dnepropetrovsk). After 1848 she traveled extensively. She became interested in spiritism and the occult during visits to India and Tibet. With the American theosophist Henry Steel Olcott she founded the Theosophical Society (q.v.) at New York City in 1875, and established a branch of the organization at Bombay, India, in 1879. Through her demonstrations of psychic phenomena she won many followers in all parts of the world. In 1884 investigators of the Society for Psychical Research, a British organi-

zation, exposed many of her demonstrations as fraudulent. She wrote extensively on the esoteric doctrines of India, her chief works being *Isis Unveiled* (1877), *The Secret Doctrine* (1888), *Key to Theosophy* (1889), and *Voice of the Silence* (1889).

BLEACHING, the process of whitening textile fibers and fabrics by treatment with chemicals or exposure to the sun and weather, usually to remove their natural color. Chemically the process of bleaching involves the change of a colored compound to a substance of little or no color. Many pigments and dyes are affected in this way by oxidizing agents, hence substances such as chlorine, hydrogen peroxide, and ozone are most commonly used for bleaches. Heat, ultraviolet light, acid, or any other agent producing chemical change may also act as a bleach.

The ancient method of bleaching by exposure to the sun's rays was practiced in ancient and medieval times in Egypt, China, and the countries of Asia Minor and Europe. In the 18th century bleaching solutions of potash and lye and of dilute sulfuric acid were used in Holland and France, and in 1785 the powerful bleaching properties of chlorine were discovered by the French chemist Claude Louis Berthollet. Bleaching powder (q.v.), a solid chemical with the same action as the gas chlorine, came into use in 1799, and was the standard bleaching agent until about 1920. Since that time the use of liquefied chlorine has increased, and new bleaching agents have been introduced, such as *HTH* (high test hypochlorite) which has two to three times the effectiveness of bleaching powder.

BLEACHING POWDER, a compound consisting of a mixed chloride and hypochlorite of calcium, CaCl (OCl), and used as a bleaching agent. Sometimes incorrectly called "chloride of lime" or "calcium hypochlorite", the industrial product also contains calcium hydroxide, calcium carbonate, and other impurities. When mixed with water or dilute acids, bleaching powder liberates chlorine, oxygen, and hypochlorous acid, and acts as a strong bleach for textiles of vegetable origin, such as cotton and linen. See BLEACHING.

BLEAK, common name for a European fresh-water fish of the genus *Alburnus*. Slim and minnowlike, it is usually about 6 inches in length, with dark back and silvery side scales. It is popular with anglers as a food fish, and its scales are used in the manufacture of artificial pearls.

BLEEDING, or HEMORRHAGE, the discharge of blood from blood vessels due to pathological conditions of the vessels, or traumatic rupture of one or more vessels. Toxic damage of bacterial or chemical origin may lead to escape of blood into the skin, mucous membranes, or body cavities.

Hemorrhage is a frequent complication of many diseases. Peptic ulcer, for example, may cause gastric hemorrhage by eroding a blood vessel. Tuberculosis often leads to pulmonary hemorrhage. Apoplectic stroke is usually due to hemorrhage in the brain, generally as a result of high blood-pressure. Hemorrhage is often the immediate cause of death in many forms of cancer. Hemorrhage is also the most frequent fatal complication of childbirth. Loss of one to three quarts of blood may lead to shock (q.v.), and unless replaced by transfusion (q.v.) is often fatal.

Bleeding normally stops through the process of clotting of the blood (q.v.), and methods used to stop hemorrhage depend on stanching the flow of blood sufficiently for a clot to form. In arterial bleeding (characterized by a pulsating stream of bright red blood) it may be necessary to apply a ligature or tourniquet, which are seldom required in venous bleeding (a steady stream of dark, bluish-red blood). In either case the most direct method is the application of pressure directly over the wound, preferably by means of a sterile dressing. Bleeding is also controlled through reducing the blood pressure by placing the patient in a recumbent position or by the use of drugs. Modern methods of controlling bleeding depend largely on increased understanding of the clotting mechanism. Thus, vitamin K is often administered to a patient, particularly before an operation, to minimize the danger of hemorrhage; see VITAMIN: *Vitamin K.* Fibrin film and fibrin foam, plastics made from the blood protein fibrinogen, are extensively used in surgery. Fibrin foam is used in the form of a surgical sponge which rapidly stops bleeding by forming clots. Fibrin film is used to wrap nerves or tendons or as a membrane to cover the brain or other organs. Either fibrin foam or fibrin film may be left in the body, where it slowly dissolves without harmful results. See also HEMOPHILIA.

BLEEK, FRIEDRICH (1793–1859), German Biblical scholar, born in Ahrensbök, and educated at the universities of Kiel and Berlin. He was professor of theology at the University of Bonn from 1829 until his death. Bleek's chief work was his commentary on the New Testament Book Epistle to the Hebrews, but he is best known for his *Einleitung in das Alte*

Testament (1860) and *Einleitung in das Neue Testament* (1862).

BLEKINGE, province of Sweden, situated in the S.E. part of the country and adjoining the Baltic Sea. It is an agricultural region, traversed by several fertile valleys, and is sometimes referred to as "the garden of Sweden". Karlskrona (q.v.) is the administrative center and chief city. Other important cities are Karlshamm and Ronneby. Area, 1173 sq.m.; pop. (1952 est.) 146,303.

BLENDE or **SPHALERITE,** mineral composed of zinc sulfide, crystallizing in the isometric system, and having hardness 4 and sp.gr. 4. Resinous luster and a tendency to cleave into perfect dodecahedral fragments are its characteristic features. Blende occurs in massive or crystalline form, and usually contains iron sulfide which gives it a dark color and gives rise to its popular name of "black jack". Sometimes, however, it is red, yellow, or green, and because of these variations and its resemblance to other minerals, it is difficult to identify. Blende is the most important ore of zinc, and is mined in many parts of the world. The U.S. produces more than any other country; half of this production is from a small district in the adjoining corners of Missouri, Kansas, and Oklahoma. It is also mined in northern England, in Bohemia, and other parts of Europe, and in Asia. See also PITCHBLENDE.

BLENHEIM, BATTLE OF, battle of the War of the Spanish Succession (see SPANISH SUCCESSION, WAR OF THE), fought on August 13, 1704, near the village of Blenheim, Bavaria, 23 miles N.W. of Augsburg. British and Austrian forces, led by the English military leader John Churchill, Duke of Marlborough, and Prince Eugene of Savoy, defeated the French and Bavarians under the French marshal Camille de Tallard and Maximilian II Emanuel, Elector of Bavaria. The casualties of the British and Austrians were 4500 killed and 7500 wounded. The French and Bavarians lost a large but undetermined number; 11,000 were taken prisoner. After this defeat French military domination of Europe began to decline.

BLENHEIM SPANIEL or **MARLBOROUGH SPANIEL.** See SPANIEL.

BLENNY, common name for small, spiny-rayed fishes of the family Blennidae, found in the seas of all parts of the world. Some blennies are capable of using their ventral fins to aid them in moving about, out of water, among rocks and seaweeds. Many members of the family retain their eggs within the oviduct until they are hatched, so that the young are produced alive and capable of seeking their own food, which consists mainly of small crustaceans. Blennies are of little value as food.

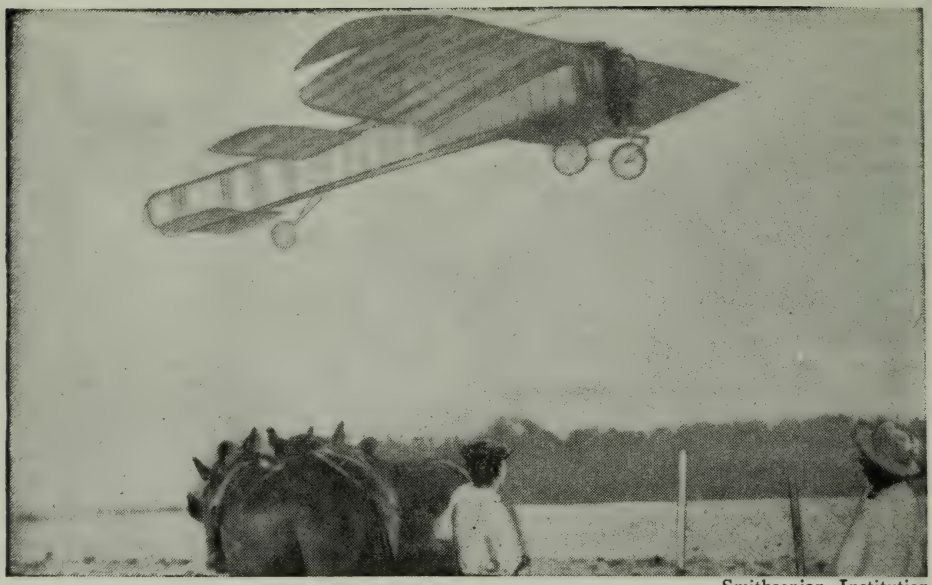
BLÉRIOT, LOUIS (1872–1936), French engineer and pioneer aviator, born in Cambrai, and educated at the École Centrale des Arts et Métiers. He was engaged in aeronautical research from 1896 to 1906, when he established the first airplane factory in France. After designing and building various types of experimental aircraft, he constructed the first practical monoplane in 1908. He continued to develop the monoplane type of aircraft despite the fact that most contemporary designers favored the biplane. The first aviator to cross the English Channel in a heavier-than-air machine, he made the flight, on July 25, 1909, from Calais, France, to Dover, England, in one of his monoplanes. During World War I Blériot's factory produced about 10,000 airplanes for the armed forces of France and the other Allied powers.

BLES, HENRI MET DE (1480?–1550?), Flemish painter, sometimes called *Civetta* (It., "owl") because he used a representation of an owl as signature. His best-known paintings include "Adoration of the Magi", in the museum in Munich, and "Christ on the Cross" and "The Reading Magdalen", both in the National Gallery, London. Two paintings attributed to Bles hang in the Metropolitan Museum of Art, New York City.

BLESBOK, South African antelope, *Damaliscus albifrons*, closely related to the bontebok. Both species are marked by a large, white spot on the forehead, which in the blesbok is divided by a dark bar between the eyes. The blesbok is slightly smaller than the bontebok and has greenish horns, whereas those of the bontebok are black. The coats of both species have a shining, purplish luster, that of the bontebok being richer. Both the blesbok and bontebok formerly roamed South Africa in enormous herds, the bontebok being restricted to the southern tip of the continent. They are now almost extinct; a few small herds raised on farms are the sole survivors.

BLESSING. See BENEDICTION.

BLEULER, PAUL EUGEN (1857–1939), Swiss psychiatrist, born in Zollikon, near Zurich, and educated at the University of Bern. He was one of the first to accept psychoanalysis, originated by the Austrian psychiatrist Sigmund Freud. In the field of psychiatry he was noted for his conception of *schizophrenia*, which he considered to be due to a split between the emotional life of the patient and his faculty of reasoning. Bleuler's writings in-



Smithsonian Institution

Monoplane invented by Louis Blériot, on a cross-country flight, France, 1910

clude *Dementia Praecox oder Schizophrenia* (1911), *Lehrbuch der Psychiatrie* (1920), and *Die Psychoide als Prinzip der Organischen Entwickelung* (1925).

BLICHER, Steen Steensen (1782–1848), Danish lyric poet and novelist, born in Vium, near Viborg, Jutland. Blicher's earliest work was a translation (1807–09) of the writings of the Gaelic poet Ossian. His own poems and novels at first attracted little attention, but his later work, particularly that written after 1826, won him a nationwide reputation. He is best known for his sympathetic and humorous renderings of the folk tales, legends, and simple peasant chronicles of his native province, notably in the poems and stories written in the Jutland dialect and collectively entitled *The Knitting Room* (1842). His collected tales and sketches were published under the title *Samlede Noveller og Skizzer* (1833–36).

BLIDA, town of Algeria, situated on a tributary of the Chiffa R., at the southern edge of the fertile Metija plain, about 30 m. by rail s.w. of Algiers. It lies at the base of the Atlas Mountains, and is surrounded by a wall. There are numerous mosques and churches in the town. Water power for a number of industrial establishments, including corn mills, is furnished by the Chiffa. Trade is chiefly in flour and in oranges grown in the vicinity. Pop. (1948) 61,607.

BLIGH, William (1754–1817), English naval officer, born in Plymouth. He sailed under the English explorer and navigator James Cook on Cook's second voyage around the world (1772–75). In 1787 he was sent by the British government to Tahiti as commander of the *Bounty* (q.v.). His crew mutinied, and on April 28, 1789, set him adrift in an open boat with eighteen loyal men. After almost incredible hardship, Bligh arrived at the island of Timor, near Java, on June 14, having sailed 3618 miles. In 1805 he was appointed governor of New South Wales, but the colonists were dissatisfied with his harsh rule and in 1808 the civil and military officers of the colony rebelled and arrested him. He was imprisoned for two years. The officer who arrested him was later tried in England for his mutinous act and was cashiered. After Bligh's return to England he was raised successively to the rank of rear admiral (1811) and vice-admiral (1814).

BLIGHT. See Diseases of Plants.

BLIND, AIDS FOR THE. The earliest recorded instance of organized aid for the blind was the foundation of a hospice for the blind by St. Basil in Cappadocia in the 4th century. Since that time many hospitals and asylums for the blind have been established; not until the close of the 18th century, however, was any organized effort made to provide the blind with education, books, rehabilitation, or

training in an appropriate occupational field.

Education. The first school for the blind was founded by the French educator Valentin Haüy in Paris in 1785; it still exists and is called the Institution Nationale. During the 1790's, schools for the indigent blind were opened in several cities in England and Scotland. Their original purpose was the instruction of the blind in manual labor, but within a few years a system of general education was adopted. In 1806 Haüy established a school for the blind in Russia and aided in the establishment of a similar school in Berlin. These schools proved so successful that by 1811 similar institutions were established throughout Europe.

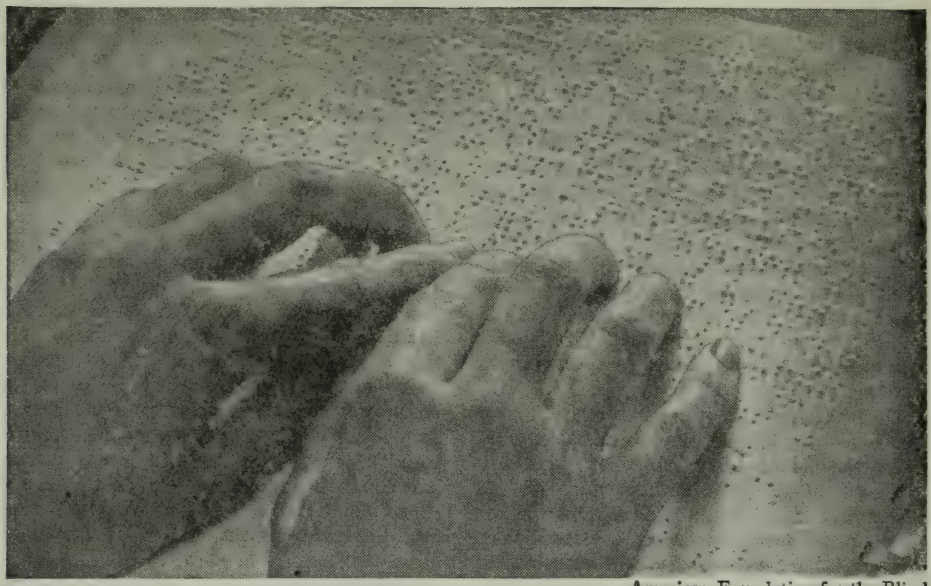
In the United States, the first institution for the blind was founded in Boston, Massachusetts, by the American physician John Dix Fisher (1797–1850). This institution was incorporated in 1829, and is now known as the Perkins Institution and Massachusetts School for the Blind; since 1913 it has been located in Watertown, Mass. The New York Institute for the Education of the Blind (1831), the Pennsylvania Institution (1833), the Ohio School for the Blind (1837), the Virginia School (1838), and the Kentucky School (1842) are among the earlier private institutions established in the U.S. These schools are under private management, but have received State aid almost from their founding. About sixty other boarding schools for the blind have been established since the middle of the 19th century.

In 1900 the city of Chicago organized classes for blind children in the public day schools. The city thereby initiated the policy, since become a feature of American education of the blind, under which the blind attend regular classes with unhandicapped children and are segregated only for special classes required by their blindness. Nearly all of the larger cities in the United States have adopted this policy, and all of the States have established schools, or made arrangements with schools of other States for free education of the blind from kindergarten through college.

Books and Writing. The first printing in raised letters on paper was introduced by Valentin Haüy in 1784. He used the italic style of type, embossing paper with large and small letters set in movable type by his pupils. Other styles of type were tried later, notably by the Scottish printer James Gall in 1827 and the American philanthropist Samuel Howe in 1833, but because of the large size of type required, the books produced were bulky and expensive. The only system of *line type* (type characters consisting of embossed lines) in current use is that invented by the Englishman William Moon in 1847. Based on outlines of the roman letters, the Moon type may be easily learned by persons who have become blind late in life, and whose hands, hardened by work, are not sufficiently sensitive to distinguish *point type.*

Point type, an arbitrary code consisting of groups of one to six dots, was invented by a Frenchman, Charles Barbier, and altered to its present form by the French educator Louis Braille (q.v.). Many modifications of the Braille alphabet were devised in attempts to simplify or improve it. Such confusion resulted from the variety of systems that a conference of workers for the blind was held in London in 1932 to standardize point systems. The conference adopted an alphabet known as *Standard English Braille*, which is the original Braille alphabet with a few modifications.

A blind student guided by his Seeing Eye dog



American Foundation for the Blind

The hands of a blind person reading from a book printed in Braille

This system is now in use throughout the English-speaking world and has been adapted to most other languages, including Chinese. Louis Braille also devised point characters for musical notation.

The principal printing establishment in the U.S. for the production of books for the blind is the American Printing House for the Blind in Louisville, Kentucky. From 1879, Congress appropriated $10,000 a year to support this enterprise; in 1919 the annual appropriation was increased to $50,000, and in 1927, to $75,000. Other printing establishments have been founded and supported by private contributions; the best known is the Howe Memorial Press of the Perkins Institution. The Perkins Institution also started the first circulating library for the blind in 1882. The Library of Congress, many State and municipal libraries, and private associations in most large cities provide circulating-library service for the blind. A more recent service of most of these libraries is the circulation of *talking books*, that is, phonograph records of readings from classical and popular literature. The magazine *Readers Digest*, which in 1929 began publishing its complete edition in Braille for free distribution to the blind, added a further free service to the blind in 1939 by making its issues available in talking-book form.

Among the early appliances for writing was the grooved tablet, a sheet of metal or board grooved in small squares. The paper is placed on the tablet and the pencil, guided by the grooves, indents the paper, forming a large, square handwriting which can be distinguished by both sight and touch. Modern methods employed in American institutions include the use of the typewriter for correspondence with persons who can see, and the use of tablets for guiding the writer in the formation of Braille characters for writing to the blind. The Braille tablet may be replaced by the Hall Braille writer, a modification of the typewriter, which embosses Braille characters on the paper instead of printing visible letters.

Rehabilitation. Pensions or similar forms of financial relief for the needy blind were first provided by New York City in 1866; the State of Illinois enacted relief measures in 1903, and by 1947 all of the States had made similar provisions. With the passage of the Social Security Act in 1935, the Federal government undertook to supplement State aid through the various branches of the Federal Security Agency. These branches include the Social Security Administration, which provides monetary benefits to blind persons; the Office of Vocational Rehabilitation, which cooperates with State, municipal, and private agencies in formulating plans for treatment and re-education of persons disabled by blind-

ness; and Services for the Blind, a division of the Office of Education which conducts surveys of industry and trains personnel executives to help the blind secure employment in suitable positions. All such Federal aid is contributed through State and municipal agencies and through local organizations supported by voluntary contributions.

Specially trained guide dogs have proved successful in aiding some of the blind. At Morristown, New Jersey, *The Seeing Eye*, a nonprofit organization, began in 1929 to supply at least one hundred such dogs a year at a nominal charge. Inasmuch as only about 5 percent of blind people can use dog guides successfully, recipients are selected with great care, and are required to complete a rigorous training period with the dog selected.

During World War II, the U.S. Army Signal Corps developed an *electronic eye* which enables a blind person to perceive obstacles in his path. The apparatus is assembled in a small case, which is carried in the hand. It projects a beam of light which is reflected into a photoelectric cell (q.v.) in the case by an obstacle in its path within 20 feet. The cell operates an ear phone or buzzer; the intensity of the sound indicates the distance of the object, and the position of the case reveals its direction. As a result of subsequent research sponsored by the Veterans Administration, an improved obstacle detector, more economical to operate and lighter in weight, was developed. The improvements were accomplished largely by the substitution of transistors (q.v.) for vacuum tubes. Another electronic device, known as the step-down detector, warns its user when he is appoaching a curb or a flight of stairs. The goal of current research (1954) is the combination of the two instruments into a single, practical unit.

The sight of many persons who are blind because of a cornea rendered opaque by accident or disease can be restored by transplanting a normal cornea to replace it. To aid in this work, an Eye Bank (q.v.) was established in New York City in 1945, to collect and preserve corneal tissue. Within a year, the eye bank had a branch in Chicago, Illinois, and had almost a hundred co-operating hospitals throughout the U.S.

Occupations and Opportunities. Opportunities for the blind are limited more by lack of self-confidence in individuals than by actual defect of vision. Many blind persons successfully conduct their own business establishments or professions; many compete successfully with persons who can see in shops and factories. In most large cities, public and private agencies provide special workshops for those needing favorable conditions of employment, and home work for the blind who cannot reach the workshop because of disability or distance. Workshops for the blind are assured of a market for certain goods, such as brooms, mops, mattresses, and bed linen, because Federal and State laws require governmental departments to purchase goods made in such shops.

BLINDNESS, complete or substantially complete absence of the sense of sight. Blindness may be caused by any obstacle to the rays of light on their way to the optic nerve, or by disease of the optic nerve or tract, or of that part of the brain connected with it. It may be present only under conditions of bright light or of comparative darkness, and may be permanent or transient, complete or partial. Few persons are born blind, although many lose their sight in infancy from preventable causes. Medical research has established the fact that considerable blindness is caused by the neglect or unsuitable treatment of inflammation of the eyes of new-born babies, and therefore legislation has been adopted in many countries specifying the treatment of all new-born infants to prevent this condition. Many persons become blind through accidents, or from complications arising from various diseases.

In the United States, Federal Social Security regulations define as blind any person whose corrected vision is less than one tenth of normal, or whose visual field is narrower than 20°. The number of such blind persons is estimated to be 1.5 per 1000 of the population. Ten percent of the blind are under twenty years of age; fifty percent are over sixty-five years of age. See Eye, Diseases of the; Sight, Defects of; Vision. See also Color Blindness.

BLISS, Sir Arthur (1891–), British composer, born in London, and educated at Rugby and at Cambridge University. He received musical instruction from the British composers Sir Charles Stanford, Ralph Vaughan Williams, and Gustav Holst. Bliss experimented with novel combinations of instruments and voices. He was knighted in 1950 and appointed Master of the Queen's Musick in 1953. Among his works are *Rout* (for soprano and chamber orchestra, 1920); *Conversations* (for violin, viola, cello, and woodwind, 1920); *Colour Symphony* (1922); two string quartets (1941, 1950); music for the ballets *Checkmate* (1937), *Miracle in the*

Gorbals (1944), and *Adam Zero* (1946); the opera *The Olympians* (1948); and *Violin Concerto* (1955).

BLISS, TASKER HOWARD (1853–1930), American soldier, born in Lewisburg, Pa., and educated at the U.S. Military Academy. During the Spanish-American War he served in the Puerto Rican campaign (1898). He was made brigadier general in 1902 and commandant of the Army War College in 1903, and he held commands in the Philippine Islands from 1905 to 1909. Bliss was chief of staff with the rank of general during World War I and a member of the U.S. delegation to the Paris Peace Conference (1918–19).

BLITZSTEIN, MARC (1905–), American pianist and composer, born in Philadelphia, Pa. He gave his first concert at the age of five, composed at seven, and made his debut as solo pianist with the Philadelphia Orchestra at fifteen. He later studied composition with the French composer and teacher Nadia Boulanger and the Austrian-American composer and teacher Arnold Schönberg, and eventually devoted his entire time to composing. Among his works are the musical plays *The Cradle Will Rock* (1937), *No for an Answer* (1941), and *Regina* (1949); chamber and piano music; the symphonic poem *Freedom Morning* (1944); the symphony *The Airborne* (1946); the ballet *The Guests* (1948); incidental music (1950) for the play *King Lear;* the opera *The Harpies* (1953); and an English adaptation of the book and lyrics of *The Threepenny Opera* (1954).

BLOCH, ERNEST (1880–), Swiss-American composer, born in Geneva. He studied violin with the Belgian violinist Eugène Ysaye and composition with, among others, the Swiss composer and teacher Émile Jaques-Dalcroze. After a career in Europe as a lecturer and conductor, he came to the United States in 1916 and in 1924 became an American citizen. In 1917 he taught at the David Mannes School of Music, New York City; he founded the Cleveland Institute of Music in 1920 and was its director until 1925, when he was appointed director of the San Francisco Conservatory. In 1940 he became professor of music at the University of California. Bloch is one of the best-known composers of the 20th century. His finest compositions, according to most critics, are those based upon or expressing the idioms and emotional qualities of Hebrew folk music, but all his music is notable for its emotional intensity and the complexity and finish of its workmanship. His works include the opera *Macbeth* (1910); *Trois Poèmes Juifs*, for orchestra (1913); the symphony *Israel* (1915); *Schelomo*, Hebrew rhapsody for cello and orchestra (1916); *Baal Shem*, for violin and piano (1925; new version, 1941); *Concerto Grosso*, for strings and piano (1925); *America*, rhapsody for orchestra, which won the $3000 prize of the magazine *Musical America* (1927–28); *Evocation*, a symphonic suite (1937); *Voice in the Wilderness*, for cello and orchestra (1937); and *Symphonic Suite* (1944). In 1942 he won the gold medal of the American Academy of Arts and Letters, the first musician so honored.

BLOCH, FELIX (1905–), Swiss-American physicist, born in Zurich, and educated at the Federal Institute of Technology, Zurich, and at the University of Leipzig. In 1932–33 he lectured on theoretical physics at the University of Leipzig. He was associate professor at Stanford University from 1934 to 1936, when he became full professor. On a leave of absence in 1954–55, he served as director of the European Nuclear Research Center, a 12-nation organization designed to develop peacetime uses for atomic energy. Bloch made significant contributions in various fields of theoretical physics, notably the electron theory of metals and the quantum theory of ferromagnetism. He is best known for his discovery of the nuclear induction method of measuring the magnetic moments of atomic nuclei. In 1952 he shared the Nobel Prize in physics with the American physicist Edward Mills Purcell.

BLOCK, ADRIAEN (fl. 17th cent.), Dutch navigator and eponym of Block Island (q.v.). He commanded the *Tijger* ("Tiger") on a voyage, late in 1613, to what is now New York harbor. Following the destruction of his vessel by fire while at anchor in the harbor, Block encamped, with his crew, on Manhattan Island. There they built a craft, named the *Onrust* ("Restless"), in which Block subsequently explored Long Island Sound. His discoveries on this voyage, which extended N. beyond Cape Cod, included the Connecticut River and the island (off the coast of present-day Rhode Island) that bears his name. He later incorporated geographical data obtained on the voyage in a map, called the *Figurative Map of 1614*, which showed for the first time that Manhattan Island is separated from Long Island.

BLOCK, HERBERT LAWRENCE, pseudonym HERBLOCK (1909–), American cartoonist, born in Chicago, Ill., and educated at Lake Forest College, Lake Forest, Ill. and the Art Institute of Chicago. He began his career as editorial cartoonist for the *Chicago Daily*

News in 1929. From 1933 to 1943 his work was syndicated by the Newspaper Enterprise Association (N.E.A.) Service, and in 1946 he joined the staff of *The Washington Post*. Block's best-known cartoons are incisive, often witty commentaries on the American political scene. He received Pulitzer prizes in 1942 and 1954. Block wrote *The Herblock Book* (1952) and *Herblock's Here and Now* (1956).

BLOCKADE, a naval operation conducted by a country at war, with the object of closing to foreign commerce the ports of an enemy country, and thereby aiding in the military defeat of that country by denying it access to supplies from without. In 1805, during the Napoleonic Wars, France declared a blockade against the British Isles. England retaliated by declaring a blockade against all continental Europe. Neither of the warring countries, however, possessed navies large enough to enforce these blockades. Such blockades, known as *paper blockades*, were merely excuses for capturing neutral ships. It is now a principle of international law that a valid blockade must fulfill the following conditions: (1) it must be ordered by the sovereign or war-making authority of the belligerent power; (2) it must be effective; and (3) neutral countries must be notified of the blockade and their vessels given reasonable time to leave the waters of the blockaded country, after which, if a neutral ship attempts to break the effective blockade, ship and cargo may lawfully be seized, but no punishment may be inflicted upon the crew. Neutral warships on diplomatic errands and ships in distress are generally allowed entry to a blockaded port.

The most effective blockade of a long coast was that maintained by the United States Navy during the Civil War. The South possessed a long land frontier, but except along the Mexican border it was dominated by the Northern forces. Northern warships prevented commerce between England, in need of Southern cotton, and the South, in need of manufactured articles from England. Only a few fast-sailing vessels known as blockade-runners managed at times to slip through.

During World War I the Central Powers were blockaded by the navies of the Allies. Though the blockade was not altogether successful in the Baltic Sea, it isolated Germany almost entirely from approach from the Atlantic Ocean. Germany failed in its attempt to break the blockade by the use of submarines; its declaration of a submarine blockade against England was regarded as invalid by neutral countries on the ground that the German submarine fleet alone was not strong enough to maintain such a blockade effectively. Neutral countries asserted it was a paper blockade and that Germany, therefore, had no lawful right to sink or seize neutral ships headed for English ports. German sinkings of American ships after protests against such acts were one reason for the United States' entry into World War I.

Blockade operations by the United States and Great Britain during World War II were again an essential part of military strategy, supplemental to air power which struck directly at the industrial economy of the enemy.

BLOCK BOOKS. See Wood Engraving.

BLOCK ISLAND, island in the Atlantic Ocean, about 9 miles s.w. of Point Judith, Rhode Island. It is coextensive with New Shoreham township, Newport Co., R.I., and is a summer resort, particularly noted for its fishing facilities. Tuna, swordfish, bluefish, mackerel, cod, and flounder are plentiful. Two lighthouses are on the island, Sandy Point Light at the northern extremity, and Southeast Light at the southeastern end. New Harbor (Great Salt Pond), on the w. side, is a popular yachting rendezvous. Old Harbor, on the E side, is the base of a commercial fishing fleet. The island, discovered in 1614 by the Dutch navigator Adriaen Block (q.v.), was first settled in 1661. Pop. (1950) 732.

BLOCK PRINTING. See Wood Engraving; Textile Printing.

BLOEMFONTEIN, capital of Orange Free State Province, Union of South Africa, situated on the Modder R., about 295 miles w. of Durban. The city is the site of several colleges, of the Boyden astronomical observatory of Harvard University, and of an observatory of the University of Michigan. Bloemfontein is one of the most important commercial centers of the Orange Free State, with a large trade in wool, and is noted for its stock fairs. Among its industries are flour milling and brewing. Pop. (1951 prelim.) 109,150.

BLOIS, capital of the department of Loir-et-Cher, France, on the right bank of the Loire R., 35 miles s.w. of Orléans. It is the center for the trade of the rich surrounding agricultural region. Among its industrial establishments are tanneries, foundries, and vinegar works, and plants engaged in the manufacture of boots, shoes, biscuits, furniture, machinery, and earthenware. Notable buildings are the cathedral, an early French Renaissance castle, and a 12th-century church. An

educational center, Blois is the site of a college, a normal school, two seminaries, a museum, and a library. Blois is of considerable historical importance. Joan of Arc used the city in 1429 as headquarters during her campaign to relieve the city of Orléans from the English siege. King Louis XII of France was born in Blois, and the courts of the French kings Francis I, Henry II, Charles IX, and Henry III were occasionally held there. Pop. (1946) 21,666.

BLOK, Aleksandr Aleksandrovich (1880–1921), Russian poet, born in St. Petersburg (now Leningrad), and educated at the University of St. Petersburg (now Leningrad). He was a leader of the Russian Modernist School. His collections of poems include *The Unexpected Joy* (1907), *Snow-Mask* (1907), *Snow-Bound* (1908), and *Night Watches* (1911). Blok's best-known work is the long poem *The Twelve* (1918), an apologia for the Russian Revolution.

BLONDEL DE NESLE (fl. 12th cent.), French minstrel, born in Nesle, Picardy. He was a favorite of King Richard I of England, whom he accompanied to Palestine on the Third Crusade. According to legend, when, in 1193, Richard on his homeward journey was imprisoned by Leopold, Duke of Austria, the minstrel wandered through Germany in disguise, seeking his master. Blondel at length discovered that Richard was being held in the castle of Dürrenstein, in Austria, when he heard Richard's voice answering a minstrel's song from the castle dungeon. The minstrel immediately returned to England, where he reported the king's place of imprisonment, and ransom was procured for Richard's release.

BLONDIN, Charles, real name Jean François Gravelet (1824–97), French acrobat and tightrope walker, born in Saint-Omer. His career as an acrobat began when he was about six years old, and he quickly won acclaim for his daring performances, becoming known as "The Little Wonder". Outstanding among the hazardous feats which he accomplished were his exhibitions, notably in 1859 and 1860, on a tightrope above Niagara Falls. The tightrope was 1100 ft. long and 160 ft. above water. On one occasion, in the course of numerous crossings of the Falls, Blondin performed his act blindfolded while pushing a wheelbarrow. He made the crossing with a man on his back on another occasion, and also crossed on stilts.

BLOOD, the fluid substance which circulates in the arteries and veins of the animal body. The constant movement of blood is brought about by the co-ordinate activity of the heart, lungs, and vessels. Blood is conveyed to the tissues through the arteries and drained from the tissues through the veins. The vessels intermediate between the finest arteries and veins are called capillaries. Blood is bright red or scarlet in the arteries, and bluish red in the veins. It is composed of a yellowish fluid, the blood plasma, in which float a large number of small cells, the blood corpuscles, which give the blood its reddish color. It has a characteristic odor and a specific gravity of between 1.056 and 1.066. Blood is a vital part of the body, for it conveys the oxygen inhaled by the lungs to the tissue cells and carries away the poisonous products of metabolism. The volume of the blood in normal men and women is one eleventh of the body weight, or about 5 to 6 quarts in an average adult (150 lbs.). In a cubic millimeter of human blood there are normally about 5,000,000 red corpuscles, 10,000 white corpuscles, and 300,000 platelets (see below).

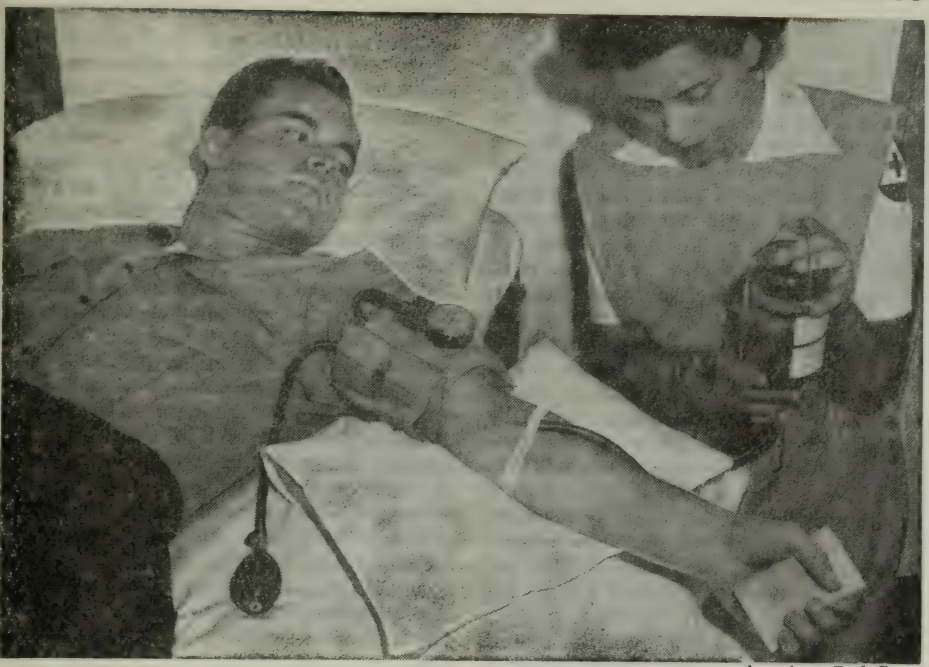
The white corpuscles, or *leucocytes*, are of two principal types: *lymphocytes*, clear, with a round nucleus; and *granulocytes*, granular, with an irregular nucleus. They possess ameboid movement. The lymphocytes are primarily scavengers, surrounding and isolating foreign bodies and absorbing dead tissue. The granulocytes kill and absorb invading microorganisms.

The red corpuscles (*erythrocytes*) are round disks about one three-thousandth of an inch in diameter, concave on both sides of the disk. In most mammals, including man, the red corpuscle contains no nucleus. In other vertebrate animals it is oval and nucleated. Its color is due to the presence of hemoglobin, a bluish-red, iron-containing compound, which readily forms with oxygen an unstable chemical compound, oxyhemoglobin, as the blood passes through the lungs. Oxyhemoglobin is bright red, and it is this change which accounts for the difference in color between venous and arterial blood.

Blood platelets, or *plaques*, are small, round, nonnucleated bodies, with a diameter about one third that of the red corpuscles. They initiate the process of blood coagulation by releasing a substance, *thromboplastin*, which activates the clot-forming materials of the blood plasma.

Blood gases consist mainly of oxygen, carbonic acid, and nitrogen. They participate in the oxygen absorption during breathing; see Respiration.

Plasma has a complex composition. In addi-



American Red Cross

Donating blood. The plasma will be separated and preserved for a future transfusion.

tion to water, its principal component, it contains inorganic constitutents, such as sodium, potassium, calcium, chloride, carbonate, and bicarbonate; the "plasma proteins"; blood sugar; and minute quantities of many other chemicals, such as enzymes and hormones, foods such as fats and amino acids, and waste products such as urea and creatinine.

Plasma proteins consist principally of the following: albumin, the chief agent in maintaining the osmotic pressure of the blood and therefore in controlling its tendency to diffuse through the walls of the blood vessels; fibrinogen and prothrombin, active in clotting; agglutinins, causing the agglutination reaction between samples of blood of different types and the reaction known as anaphylaxis; and globulins of many types, including some which create antibodies and thus provide immunity against certain diseases. Separation of the plasma proteins so that they might be individually studied was first accomplished in the 1920's, and large-scale fractionation, so that the individual fractions could be used, was accomplished during World War II by the American biochemist Edwin Joseph Cohn and associates. Immediate results of this work include the use of serum albumin as a substitute for blood or plasma for transfusions; the use of gamma globulin for the prevention of such diseases as measles, infectious hepatitis, and infantile paralysis (q.v.); and the use of fibrinogen to control bleeding.

Coagulation of the Blood. One of the most remarkable properties of the blood is that of "clotting" or "coagulating" on being withdrawn from the body. In the vessels of the body the blood is in a fluid condition, but shortly after being withdrawn, instead of remaining fluid, it becames viscid and gelatinous, and "sets" into a firm, jellylike mass. This mass then separates into two portions, a firm, red *clot*, floating free in a clear, transparent, straw-colored fluid, the *serum*.

A clot consists almost entirely of the red corpuscles of the blood entangled in a meshwork of fine fibrils or threads, which are composed of a substance called *fibrin*. This substance does not exist as such in the living blood, but is formed at the moment of coagulation by the combination of fibrinogen, one of the plasma proteins, with thrombin. Thrombin is not present in normal blood, but is formed from prothrombin, another of the plasma proteins, by a complex process involving many factors, including the blood platelets, certain calcium salts, substances produced by injured tissue, and contact with rough sur-

faces. In the absence of any one of the above factors a clot rarely forms. Thus, the addition of sodium citrate removes calcium ions from the blood, and so prevents the clot from forming. Lack of vitamin K prevents maintenance of the proper amount of prothrombin in the blood; see VITAMIN. Certain diseases may cause lowering of the amount of fibrinogen or platelets in the blood. See BLEEDING.

Formation of the Blood. Red cells are formed in the bone marrow and destroyed in the liver and spleen after an average life of a few weeks. Of the white cells, the granulocytes are formed in the bone marrow, and the lymphocytes are formed in the lymph glands. Platelets are formed in the marrow. All of these elements of the blood are continually worn out or consumed, and must be as continually replaced. The constitutents of the plasma are formed in various organs of the body, chiefly in the liver, which makes albumin and fibrinogen and stores blood sugar. Chemical impurities are removed from the blood by the kidneys, the sweat glands, and the liver.

Constancy of the blood is one of its most extraordinary characteristics. Its alkalinity is so nearly constant, for example, that if the pH should fall to 7.0 (the same as that of pure water), the individual would go into an acidosis coma which would probably be fatal; if, on the other hand, the pH should rise above 7.5 (the same as that of a solution containing one part of caustic soda in fifty million of water) the individual would go into an alkalosis tetany which would also probably be fatal. Similarly, the blood-sugar concentration, normally about 0.1 percent, cannot fall below 0.05 percent without the onset of convulsions, and a persistent blood-sugar concentration above 0.15 percent is frequently accompanied by diabetic coma (see INSULIN; DIABETES). Certain organs of the body, such as the stomach, intestines, liver, and kidneys, normally undergo variations thousands of times as great as that of the blood. The temperature of blood in a normal individual does not vary by more than 1° from about 37°C. (98.6°F).; a change of from 6 to 10°F. usually causes death, even though the individual may survive environmental temperature changes of over 100°F.

See ANEMIA; BLOOD PRESSURE; CIRCULATION; HEART; HEMOGLOBIN; PULSE; RH FACTOR; TRANSFUSION OF BLOOD.

BLOOD, THOMAS, commonly 'nown as COLONEL BLOOD (1618?–80), Irish adventurer. He was a member of the Parliamentary army during the British Civil War. For his services against the royalists he received several large grants of land in Ireland. After the reestablishment (1660) of the British monarchy he was deprived of these grants. He subsequently became associated with a group of disgruntled Parliamentarians and attempted to organize an insurrection against the royal authorities in Dublin. Upon discovery of the plot he fled to Holland, but soon afterward made his way to England. In May, 1791, Blood, disguised as a clergyman and accompanied by a few confederates, succeeded in stealing the British crown from the Tower of London. He and one of his associates were quickly captured, however, and committed to the Tower jail. Soon thereafter Blood was visited in the Tower by King Charles II. Presumably acting on the advice of the royal favorite George Villiers, Duke of Buckingham (who had probably been involved with Blood in a plot to murder the lord lieutenant of Ireland James Butler, Duke of Ormonde), King Charles pardoned the miscreant and restored his Irish estates. Blood was an influential figure in court circles during the next few years.

BLOOD BANK. See TRANSFUSION OF BLOOD.

BLOOD, CIRCULATION OF. See CIRCULATION OF THE BLOOD; CIRCULATORY SYSTEM, EVOLUTION OF.

BLOOD, DISEASES OF THE, disorders arising from abnormal changes in the composition of the blood. Abnormal reduction in the number or hemoglobin content of the red blood cells causes *anemia.* Increase in the number of red cells is usually not pathological. Reduction in the number of white blood cells, depriving the individual of the protection of these phagocytes (see BLOOD), is called *leucopenia;* an abnormal increase in their number, called *leucocytosis* (q.v.) or *leukemia,* is characteristic of severe diseases of the blood-forming organs. In the blood plasma, lack of clotting elements causes *hemophilia,* and excess of certain other elements normally present is characteristic of such diseases as *uremia* and *diabetes.* Foreign substances in the plasma may give rise to *toxemia.* Pathogenic organisms may invade the blood stream. In such diseases as *malaria, sleeping sickness,* and *schistosomiasis,* the blood is the primary seat of infection. In other cases, when the organism escapes into the blood stream from a local infection, the condition is called *bacteremia.* See separate articles on diseases mentioned.

BLOOD FEUD. See VENDETTA.

BLOODFLOWER, common name for the orange-red flower of the tropical milkweed, *Asclepias curassavica.* The name is applied also to the blood lily, *Haemanthus coccineus.*

BLOOD FLUKE. See FLUKE; SCHISTOSOMIASIS.

BLOODHOUND, breed of hunting dog, the oldest known of the type that hunts by scent alone. The bloodhound was reputedly known in the countries around the Mediterranean Sea before Christian times and it was introduced into other parts of Europe in medieval times. Tireless in pursuit of its quarry, either animal or human, it can follow a scent over dry land where no tracks are visible and, after swimming across a river, can pick up the scent on the far bank. It has been known to follow a human trail for over a hundred miles. The bloodhound, which does not attack its human quarry, is used by police departments, particularly in the United States, for tracking criminals; the dog's identification of a criminal by smell is accepted in U.S. courts of law.

The bloodhound has thin, loose skin, hanging in folds about the head and neck and forming a dewlap; diamond-shaped, deeply sunken eyes which give it a mournful appearance; long, soft ears falling in folds; a long neck; muscular, sloping shoulders; and well-sprung ribs. Its color may be red-and-tan, black-and-tan, or tawny. Its height is 26 inches or more; the weight of the male is 90 to 110 pounds, of the female, 80 to 100 pounds. The bloodhound is one of the shyest and most docile of dogs and is extremely sensitive to both punishment and kindness.

BLOOD OF OUR SAVIOUR, also called ORDER OF OUR REDEEMER AND THE PRECIOUS BLOOD OF JESUS CHRIST, an order of knighthood in the duchy of Mantua, Italy. It was instituted by Duke Vincenzo Gonzaga in 1608, on the occasion of the marriage of his son with a daughter of the Duke of Savoy. It consisted of twenty knights, of whom the Mantuan dukes were sovereigns. The name originated in the belief that in St. Andrew's Church, in Mantua, certain drops of our Saviour's blood are preserved.

BLOOD PRESSURE. The estimation of the blood pressure within the circulatory system (see CIRCULATION OF THE BLOOD) has become important in the study of diseases. The blood as it flows through the vessels necessarily exerts lateral pressure upon their walls; this pressure is dependent on several factors, namely, the energy of the heart, the volume of blood, the elasticity of the vessel walls, and the peripheral resistance of the capillaries. Anything which dilates or contracts the blood vessels or affects their elasticity, or any disease of the heart, interfering with its propulsive power, correspondingly affects the blood pressure. In the healthy animal the blood pressure, within certain average limits, is maintained with great constancy. The complex nervous mechanisms, controlled both by cerebrospinal and sympathetic nerve centers, which balance and co-ordinate the activity of the heart and arterial muscles, permit great local variations in blood flow without disturbing the general arterial pressure.

Lewis Layton

Bloodhound

Blood pressure is measured by an instrument, called the sphygmomanometer, consisting essentially of a broad band, lined with a flat, distensible rubber tube. The band is wrapped around the patient's arm, and the tube is inflated with a rubber bulb, until the artery is compressed and the pulse (q.v.) no longer distinguishable. Another tube connects with a manometer, and the amount by which the mercury is raised represents the blood pressure. A graphic reading may be obtained by means of a delicate needle floated on the column of mercury. The point of the needle is brought into contact with a revolving cylinder, and the slightest variations of the pulse and pressure are thereby recorded.

During a single cardiac cycle or heart beat, the blood pressure varies from a maximum during cardiac systole or heart contraction to a minimum during cardiac diastole or heart relaxation. These two pressures are called *systolic* and *diastolic* respectively. In reporting a measurement of blood pressure, both of these figures are generally given; when a single figure is given, it is usually the systolic pressure. Systolic pressure corresponds to the least pressure on the sphygmomanometer

which will allow the pulse to be noted during the systolic peak; diastolic pressure corresponds to the highest pressure on the sphygmomanometer which will allow the pulse to be noted throughout the cardiac cycle.

The average arterial blood pressure in healthy adults during cardiac systole varies between 100 mm. and 130 mm. In childhood 90 to 110 mm. may be considered normal. After middle life the pressure increases, still within normal limits to between 145 and 160 mm. A higher pressure is regarded as pathological. In kidney or brain diseases a reading of 250 or 300 mm. is not uncommon. Blood pressure varies in different individuals, and in the same individuals at different times. It undergoes spontaneous diurnal fluctuations, being lowest during sleep; it is influenced by posture, by the process of digestion, and by external changes of temperature and altitude. It is increased by muscular exertion and by mental emotions. Chronic worry, the habitual use of tobacco, overeating, and, to some extent, steady drinking, are conducive to hypertension (q.v.), which is generally considered a factor in the production of arteriosclerosis (see ARTERIES, DISEASES OF). Poisons generated within the body cause extreme hypertension, those resulting from Bright's disease, uremia, eclampsia, and intestinal fermentation being common causes. Abnormally low pressure (hypotension) is observed in infectious and wasting diseases, hemorrhage, collapse, and shock.

BLOODROOT, common name for a low, perennial herb, *Sanguinaria canadensis*, belonging to the Poppy family. Found throughout North America, it bears showy, white flowers in early spring. The names "bloodroot" and "Indian paint" are applied to the plant because its roots contain orange-red juice which was used as war paint and dye by the Indians. Today the juice is sometimes used in medicine as an emetic and expectorant. The plant is also called "puccoon".

BLOODSTONE, semiprecious stone of green chalcedony spotted with red jasper, found in Asia and the Hebrides Islands. When seen under water by sunlight, the stone appears to be entirely red, and was therefore also known as heliotrope (Gr. *helios*, "sun"; *trope*, "turning"). The bloodstone was much prized for cameos and intaglios in ancient times and in the Middle Ages. Now it is used chiefly in signet rings. The red iron ore hematite (q.v.) is also called bloodstone.

BLOOD TRANSFUSION. See TRANSFUSION OF BLOOD.

BLOOD VESSELS. See CIRCULATION OF THE BLOOD; CIRCULATORY SYSTEM, EVOLUTION OF.

BLOODWORM, name usually applied to the red larvae of midges of the genus *Chironomus*, used as bait by fishermen. It is applied also to certain annelid worms of the family Terribellidae which have soft bodies and red blood, and to parasites which inhabit the blood of vertebrates.

BLOODY ASSIZES, name given to a series of treason trials conducted by Lord Chief Justice George Jeffreys in the western counties of England after the suppression of a rebellion led by James Scott, Duke of Monmouth, in 1685. During the trials, which were conducted by Jeffreys with ruthless disregard of the defendants' legal rights, over three hundred persons were sentenced to death, and over eight hundred to penal transportation to the British colonies in America. See JEFFREYS, GEORGE.

BLOOMFIELD, town of Essex Co., N.J., 4 miles N.N.W. of Newark and 11 miles W. of New York City. Settled in 1675, Bloomfield was a part of Newark until incorporated as a township in 1812. It was named in honor of the American Revolutionary soldier General Joseph Bloomfield. In 1900 it became a town. A leading point of interest in Bloomfield is the "Green" or "Common", a training ground for soldiers during the Revolutionary War and now a public park. The town is the site of Bloomfield College and Seminary, opened in 1869 as a theological seminary and now a coeducational college. Many nationally know industrial firms maintain establishments in Bloomfield. Manufactures include woolen goods, tungsten wire, paper, paper boxes, cod-liver oil, pharmaceuticals, lawn mowers, fire-fighting equipment, plastics, brushes, electrical appliances, cosmetics, perfumes, rubber goods, electric elevators, tile and terrazzo, tools, safety razors, motors, and plumbing supplies. Pop. (1950) 49,307.

BLOOMFIELD, MAURICE (1855–1928), American philologist and Sanskrit scholar, born in Bielitz, Austrian Silesia. Bloomfield was brought to the United States in 1867. He studied at the University of Chicago, Furman University (Greenville, S.C.), Johns Hopkins University, and the universities of Berlin and Leipzig. In 1881 he became assistant professor, and later professor of Sanskrit and comparative philology, at Johns Hopkins. Bloomfield contributed extensively to Oriental journals and philological periodicals, and his researches in connection with the Sanskrit epic poem *Atharva-Veda* are

especially important. Among his works are *Cerberus, the Dog of Hades* (1905); *The Religion of the Veda* (1908), which treats the subject of Sanskrit religious poetry thoroughly from the Rig-Veda to the Upanishads; and a *Vedic Concordance* (1906).

BLOOMINGTON, county seat of McLean Co., Ill., about 58 miles N.E. of Springfield. It is in the Illinois corn belt and on the edge of the Illinois coal fields. An important trading and industrial center, the city is served by four railroads and contains railway-repair shops, foundries, soybean mills, and candy factories. In addition, refrigerating equipment, oil burners, washing machines, and mattresses are manufactured. Bloomington was laid out in 1831 and incorporated as a city in 1850. In 1856 the Illinois Republican Party was established at Bloomington. At the founding convention Abraham Lincoln delivered a famous speech against slavery. The American Passion Play is staged annually in Bloomington at the Scottish Rite Temple. The city is the site of Illinois Wesleyan University. Pop. (1950) 34,163.

BLOOMINGTON, county seat of Monroe Co., Ind., about 50 miles s.w. of Indianapolis. Dairy farming is a leading industry in the surrounding region, and the city is the center of the great limestone industry, with more than twenty quarries and stone mills in the vicinity. Other industries include meat packing and the manufacture of lumber, furniture, flour, plate glass, mirrors, woodenware, creosoted paving blocks, and storage batteries. In addition, the city contains railway repair shops. Bloomington was settled in 1818 and incorporated in 1876. It is the site of Indiana University. Pop. (1950) 28,163.

BLOUNT, WILLIAM (1749–1800), American political leader, born in Edgecombe County, N.C. He was a member of the Continental Congress in 1783–84 and again in 1786–87, and of the Constitutional Convention of 1787. In 1790 President George Washington appointed him governor of "The Territory of the United States South of the Ohio", and soon afterward Blount founded the city of Knoxville, in present-day Tennessee. When Tennessee was admitted to the Union in 1796, Blount was elected a member of the U.S. Senate from that State. In July, 1797, he was apprehended in a conspiracy to wrest New Orleans and the Floridas from the Spaniards on behalf of Great Britain, and was summarily expelled from the Senate on a charge of "high misdemeanor entirely inconsistent with his public trust and duty". The pro-British scheme caused much excitement at the time, among both members of Congress and the general public, and has since been known as "Blount's Conspiracy". His formal trial was postponed until 1798, and early in 1799 the Senate decided to dismiss the impeachment because of a lack of jurisdiction, Blount not then being a member. Soon after his expulsion from Congress he was elected to the State senate of Tennessee, over which he presided for some time.

BLOWFLY. See FLESH FLY.

BLOWGUN, weapon used for both war and hunting by Indian tribes formerly inhabiting New York State and the Gulf region of the United States, by the natives of equatorial South America, and by the Malays of the East Indies. It consists of a straight tube from 8 to 12 feet in length, made of a hollow reed or cane or from two pieces of wood hollowed out and fitted together. A light dart is propelled from the tube by the breath. The dart is usually tipped with poison, so that a slight scratch will produce death or paralysis.

BLÜCHER, GEBHARD LEBERECHT VON (1742–1819), Prussian general, born in Rostock, Germany. He joined the Swedish army in 1756, and was captured by the Prussians during the Seven Years' War. He then joined the Prussian army, but after a few years of service obtained a discharge. In 1787, he re-enlisted, with the rank of major. He distinguished himself during the Napoleonic Wars and, as commander in chief of the Silesian army of Prussian and Russian troops, won many victories. In 1813 he was made field marshal general, and in 1814 prince of Wahlstatt. In 1815 he was severely defeated by Napoleon I at Ligny, but personally rallied his scattered troops. The victory of the British general Arthur Wellesley, Duke of Wellington, at the Battle of Waterloo (see WATERLOO, BATTLE OF) was insured by the timely arrival on the field of Blücher's army. Napoleon's forces were routed by the Prussians. Rejecting a French proposal for a truce, Blücher pursued the enemy to the gates of Paris and occupied (July 7, 1815) the French capital. Several months later he retired to private life. He subsequently received a special Iron Cross from the Prussian king Frederick William III.

BLÜCHER or **BLUECHER,** VASILI KONSTANTINOVICH (1889–), assumed name of a Russian general. His real name is not known

Bluebird of eastern North America

He was a private in the Russian army during World War I, but rose to prominence after the revolution of 1917, in which he took an active part on the side of the Bolsheviks. In 1919–20 he commanded troops which defeated anti-Bolshevik armies led by Baron Pëtr Nikolaevich Wrangel and Aleksandr Vasilievich Kolchak, and in 1922 took the terminus of the Trans-Siberian railway, Vladivostok, from Japanese occupation troops. Under the name of Ga-lin he was a military adviser to the Chinese revolutionary party (Kuomintang) in Canton from 1924 to 1927, and to the Chinese Nationalist leader General Chiang Kai-shek from 1926 to 1928. In 1929 Blücher was appointed commander of Soviet military forces in eastern Siberia. He was dismissed from his position under mysterious circumstances in 1938. Nothing is known of his subsequent activities or whereabouts.

BLUEBEARD, fictitious protagonist of a tale found in the folklore and literature of many peoples. The best-known version appears in the book of fairy tales *Contes de Ma Mère l'Oye* (1697) by the French writer Charles Perrault. The Bluebeard of Perrault's tale is the Chevalier Raoul, and his surname refers to the color of his beard. His first six wives have mysteriously disappeared. A month after his marriage to a seventh wife, Fatima, Bluebeard departs on a journey. He leaves his wife the keys of his castle, but forbids her to enter one particular room. She disobeys, however, and finds in the forbidden room the bones of her predecessors. Bluebeard, discovering her disobedience, tells her she must die. Her two brothers arrive and kill Bluebeard just as he is about to cut off his wife's head. Bluebeard in Perrault's version is believed to represent the French nobleman Gilles de Rais, who was hanged for multiple murder in 1440.

The story has also been the subject of a number of works for the stage, including the plays *Bluebeard, or, Female Curiosity* by the English playwright George Colman, the younger, and *Blaubart* by the German author Ludwig Tieck; the comic opera *Barbe-Bleue* by the French composer Jacques Offenbach; the grand opera *Ariane et Barbe Bleue* by the French composer Paul Dukas; and the ballet *Bluebeard* by the Russian choreographer Michel Fokine, with a score consisting of selections from the music of Offenbach's opera.

BLUEBERRY, name applied to several shrubs, native to the United States, and to their blue or black fruit. The plants belong to the genus *Vaccinium* in the family Ericaceae (q.v.), which includes the huckleberry (q.v.). Various species of blueberry are categorized as low-bush or high-bush, depending on height; the latter varies from 2 ft. to 20 ft. Mostly deciduous, the bushes bear sweet, blue or black berries, which grow singly or in clusters. Large quantities of the wild fruit are gathered and consumed annually. In recent years several new varieties have been developed and are under extensive cultivation in the southern and New England States. The foliage of the evergreen species, *V. ovatum,* known popularly as huckleberry greens, is widely used for decorative purposes.

BLUEBILL, common name for an American duck, so called from the light blue-gray color of the bill. The name is applied to two related species, the greater scaup duck, *Nyroca marila,* and the lesser scaup, *N. affinis.* The bluebill breeds in subarctic regions and winters along the coasts of the Atlantic Ocean and the Caribbean Sea. It is a true sea duck, but may also be found in large numbers on rivers and lakes. In the male, the head, neck, breast, and upper back are black; the rest of the body is white, with narrow black stripes across the back. The female is brown where the male is black, but her markings follow the same pattern. The call of the bluebill is low and husky, and sounds more like *scaup* than *quack.*

BLUEBIRD, Blue Warbler, Blue Redbreast, or Blue Robin, a common name for a small bird, *Sialia sialis*, of the Thrush family, found throughout eastern North America. In the west it is replaced by the mountain bluebird, *S. currucoides*, and the western bluebird, *S. mexicana*. The bluebird is about 7 in. in length, much smaller than the robin, which it otherwise resembles. The breast is reddish brown, the under part of the tail and abdomen white, and the upper parts sky blue. The female is duller in color. Bluebirds usually build their nest in a hole in a tree, lining it with grasses. The female lays from four to six pale-blue eggs during a season.

BLUEBOTTLE. See Centaurea; Flesh Fly.

BLUE CARDINAL. See Lobelia.

BLUE CROSS PLANS, collective designation applied to a system of voluntary, nonprofit organizations providing prepayment of hospitalization costs for subscribers. The Plans are approved under standards established by the American Hospital Association, a nonprofit organization representing the hospitals of the United States and Canada. Each Blue Cross Plan is a local, independent service organization which assures members specific services rather than cash indemnity payments in case of hospitalization. A Blue Cross Plan enters into a contract with hospitals in its area to furnish the specific services for its members. Although each Plan's contract differs as regards costs and benefits, the most typical Plan provides seventy days of hospital care in a semiprivate room, board, laboratory tests, general nursing care, drugs, dressings, operating-room facilities, and other auxiliary services. The average 1955 cost for membership was $2 per month for an individual and $5.25 for a family.

Enrollment in Blue Cross Plans generally is through groups of employed persons at their place of employment, but nearly all Plans offer individual membership to those unable to join through a group.

To render service to members throughout the world, Plans co-operate in national programs covering transfer of members, reciprocal service benefits, and enrollment of national firms. National programs and policies are administered by the Blue Cross Commission, composed of one representative from each of 12 Blue Cross regional districts and three representatives appointed by the president of the American Hospital Association.

The Blue Cross system developed from a prepayment plan originated in 1929 at Baylor University Hospital in Dallas, Texas. Approximately 1500 Dallas public-school teachers agreed to pool $.50 monthly into a common fund to finance hospital care for any member in the event of illness. Since 1929, 86 approved Plans have been established, with membership as of April 1, 1955, totaling more than 48 million persons. There are 80 approved Plans in the United States, 5 in Canada, and 1 in Puerto Rico. In 1953, 6,812,960 members received hospital care costing $673,838,862.

See Blue Shield Plans; Hospitalization Insurance.

BLUEFISH, common name for a fish, *Pomatomus saltatrix*, living in warm seas throughout the world. Bluefish are voracious, and large schools enter the coastal waters in spring to prey on other fish as they come inshore to spawn. One of the most important food fish of the U.S. Atlantic seaboard, the bluefish is also highly regarded as a game fish. The largest specimen ever taken on rod and reel weighed 25 lbs., but the usual specimen is from 5 to 15 lbs.

Bluefish

BLUE FLAG. See Iris.

BLUEGRASS, common name for several perennial grasses of the genus *Poa*, some of which are characterized by bluish-green stems. Other common names for grasses of this genus are meadow grass, June grass, and spear grass. *P. pratensis*, the most familiar species, is a native of the cooler parts of Europe and Asia, though it has been naturalized in the United States and called Kentucky bluegrass. These grasses thrive particularly well in clay soils overlying limestone, a structure found in the well-known *Kentucky bluegrass region*, which lies partly in Tennessee. Bluegrass is used for pasturage and lawns, and yields good hay.

BLUE GROTTO (It. *Grotto Azzurra*), partly submerged cave situated on the coast of the island of Capri, in Napoli Province, Italy. Its name is derived from the optical effect of sunlight passing through the water, imparting a blue color to all objects within the cave. Elliptical in shape, the Blue Grotto is 175 ft.

long and 100 ft. wide at its broadest point, with a total circumference of about 1250 ft.; its roof rises from an opening about 3 ft. high to a maximum height of about 41 ft., and the depth of the water within the cavern is about 48 ft. The cave was discovered by the ancient Romans, but its location was forgotten and remained unknown for many centuries before its rediscovery in 1826. The Blue Grotto is visited annually by thousands of tourists, who enter by means of small boats.

BLUE GUM. See EUCALYPTUS.

BLUE JAY. See JAY.

BLUE LAWS, laws which impose harassing restrictions on individuals in regard to their ordinary habits or private morals. The term is often specifically applied to a reputed code of severe laws for the regulation of personal conduct, particularly in regard to observance of the Sabbath, supposed to have been in force in various parts of New England in the 18th century. The erroneous belief (already current by the middle of that century) in the existence of such a code gained support in the satirical description of a number of laws of the Colony of New Haven given in *General History of Connecticut* (1781) by Samuel Peters, a Tory clergyman who had fled to England during the American Revolution. The existence of an actual code has been discredited, but many of the laws described by Peters appear, with slight modifications, in the statute books of the New England colonies.

BLUE NILE. See NILE.

BLUE RACER. See BLACK SNAKE.

BLUE RIDGE or **BLUE RIDGE MOUNTAINS,** easternmost range of the Appalachians, extending from northern Georgia northeastward across western North Carolina and western Virginia into West Virginia. The northern terminus of the range is generally considered to lie at a point near Harpers Ferry, W.Va. In the view of some authorities, however, the Blue Ridge may be regarded as including the ranges which project northward from the region of Harpers Ferry into Maryland, Pennsylvania, and New York. The highest summits of the range occur in the Black Mountains, a subsidiary range in North Carolina. Mount Mitchell (6684 ft.), the highest peak E. of the Mississippi R., is situated in the Black Mts. A number of other summits, including Mount Buckley (6599 ft.), are over 6500 ft. The average elevation in the Blue Ridge varies between 2000 and 4000 ft., with the lower average confined generally to the N. portion.

BLUES, a form of jazz (q.v.) music. A blues composition consists of a sustained, syncopated melody in 2/4 or 4/4 time with a strongly rhythmic accompaniment and a stanza form of twelve measures. Blues texts are characterized by the expression of lamentation, grief, or depression, usually caused by trouble in love. The form is derived from a type of American-Negro song of Southern origin. Blues first gained widespread popularity in 1909 when the American composer William Christopher Handy composed *Memphis Blues*. Since that time innumerable blues have been composed, among them *St. Louis Blues*, *Limehouse Blues*, and *Livery Stable Blues*. Blues melodies are often part of more elaborate compositions by modern composers, such as *Krazy Kat* (1922), a ballet by the American John Alden Carpenter; *La Création du Monde* (1923), a ballet by the Frenchman Darius Milhaud; and *Rhapsody in Blue* (1924), *Piano Concerto in F* (1926), and *An American in Paris* (1928), all by the American George Gershwin.

BLUE SHIELD PLANS, collective designation applied to a system of voluntary, nonprofit, medically sponsored organizations providing medical and surgical services to subscribers. Blue Shield Plans are generally coordinated with Blue Cross Plans (q.v.), and are approved under standards administered by Blue Shield Medical Care Plans, Inc., the national association of these Plans. Included as a primary requirement of the Blue Shield approval standards is the stipulation that each Plan must have the sponsorship or endorsement of the State or county medical societies within the area served.

Blue Shield Plans provide medical and surgical benefits as well as various ancillary services. Most Plans pay in full for all services enumerated in the contracts of members whose incomes fall within limits set by the Plan. Some Plans provide specified indemnity payments irrespective of income limits.

On March 31, 1955, there were 68 Blue Shield Plans operating in the continental United States, 1 in Hawaii, 1 in Puerto Rico, and 6 in Canada, with a total membership of over 32,500,000. Payments for benefits received by members in 1954 totaled $301,125,564.

BLUEWING. See TEAL.

BLUM, LÉON (1872–1950), French statesman and political leader, born in Paris, and educated in philosophy at the École Normale Supérieure under the French philosopher Henri Bergson, and in law at the Sorbonne. At the outset of his career Blum practiced

law and at the same time was active as a writer and dramatic critic. From 1919 to 1928, and again from 1929 to 1940, he was a member of the Chamber of Deputies. He headed the *Front Populaire*, a coalition of French leftist parties which secured a majority in the Chamber in the elections of 1936. Blum was premier in 1936 and again, briefly, in 1938. During his first premiership a 40-hour work week and nationalization of war industries were established by law in France. During the Spanish Civil War (1936–39), in spite of sympathy for the Spanish Republicans among the left-wing followers of his government, Blum felt that intervention on either side would endanger the peace of Europe, and took the lead in forming a nonintervention committee of European powers. However, he opposed the appeasement of the Axis Powers by England and France which culminated in the Munich Pact (q.v.) of 1938.

After the defeat of France in World War II, Blum was interned by the German-dominated government which controlled his country. At the Riom trials of 1942, in which Blum and other opponents of fascism in France were charged with war guilt, Blum's vigorous and eloquent defense helped to cut the trial short without conclusion. Interned in Austria, he was freed by Allied troops in May, 1945. In January, 1946, he was appointed ambassador extraordinary to foreign countries; in the United States he helped negotiate credits of $1,370,000,000, granted in May, 1946, from the United States to France. The French General Assembly elected him interim premier in December, 1946, until the election of the first president of the 4th French Republic, Vincent Auriol, in January, 1947.

BLUME, Peter (1906–), American painter, born in Russia, and educated at the Art Students League of New York. His family brought him to the United States when he was five years old. In his early works he was influenced by cubism, but by 1932 he had developed a markedly surrealistic style. He won recognition as a leading American modernist painter in 1934, when his "South of Scranton" won first prize at the Carnegie International Exhibition. Besides unusual creative talent, Blume possesses extraordinary technical skill and a flair for clear and vivid colors. His best paintings are fantasies with profound symbolic content. He is represented in the collections of the Museum of Modern Art, the Whitney Museum, and the Metropolitan Museum of Art, all in New York City, and in other outstanding museums.

BLUMENBACH, Johann Friedrich (1752–1840), German naturalist, physiologist, and anthropologist, born in Gotha, and educated at the universities of Jena and Göttingen. He became professor of medicine at the University of Göttingen in 1776 and exercised great influence as a teacher for more than fifty years. He has been called the founder of the science of anthropology. His *Collectionis suae Craniorium Diversarum Gentium* (1790–1828) contained the results of his observations upon the skulls of different races. Blumenbach advocated the theory of the unity of the human race and divided the race into five types: Caucasian, Mongolian, Malay, American, and Ethiopian. He was among the first to place comparative anatomy on a completely scientific basis. Among his works are *Handbuch der Naturgeschichte* (1780), *Ueber den Bildungstrieb und das Zeugungsgeschäft* (1791), and *Handbuch der vergleichenden Anatomie* (1805).

BLUNDEN, Edmund Charles (1896–), British author and poet, born in London, and educated at Queen's College, Oxford University. After serving in the British army during World War I, he joined the staff of the London weekly *Athenaeum*. He was professor of English literature at the Imperial University, Tokyo, Japan (1924–27), and fellow and tutor in English literature at Merton College, Oxford (1931–43). In 1953 he became head of the English Department of the University of Hong Kong. Blunden is best known for his poetry, dealing mainly with nature and pastoral life, and marked by a combination of meditative and lyrical qualities. His poetic works include *Poems, 1914–30*; *Poems, 1930–40; Shells by a Stream* (1944); and *After the Bombing* (1948). Among his prose writings are *The Mind's Eye* (1934); *Thomas Hardy* (1942); *Cricket Country* (1944); and *Shelley, a Life Story* (1946). Blunden also wrote *The Dede of Pittie* (dramatic scenes, 1953).

BLUNT, Wilfrid Scawen (1840–1922), English poet, born in Sussex, and educated at St. Mary's College, Oscott. From 1858 to 1869 he served as attaché to various British embassies in Europe, and thereafter traveled extensively in North Africa, the Near East, and India. His observations of the European exploitation of native peoples led him to support the cause of nationalism in Egypt and India. Blunt also advocated home rule for Ireland, and in 1887 suffered imprisonment for his activities in behalf of this cause. Among his political writings are *Ideas about India* (1885), *Future of Islam* (1888), *Secret History of the*

English Occupation of Egypt (1907), and *The Land War in Ireland* (1912). His poetic works include *Love Sonnets of Proteus* (1880), *Esther* (1892), *Griselda* (a novel in verse, 1893), and *Seven Golden Odes of Pagan Arabia* (1903). He is also the author of *My Diaries* (1919–20).

BLUNTSCHLI, JOHANN KASPAR (1808–81), Swiss legal scholar and statesman, born in Zurich, and educated at the universities of Zurich, Berlin, and Bonn. In 1848, after a political career in Switzerland, he became professor of civil and international law at the University of Munich. At that institution he wrote *Allgemeines Staatsrecht* (1852), which forms the principal basis for his reputation as a legal scholar. Bluntschli was one of the founders (1873) of the Institute of International Law at Ghent.

BLY, NELLIE, pseudonym of ELIZABETH COCHRANE SEAMAN (1867–1922), American journalist. Noted for her enterprise in news reporting, she served at various times on the editorial staffs of the newspapers the Pittsburgh *Dispatch*, the New York *World*, and the New York *Journal*. In 1888 she spent ten days in the insane asylum on Blackwell's Island, New York City, to gather material on the treatment of its inmates. In 1889 she made a celebrated trip around the world by train and steamer to beat the time of the fictional character Phineas Fogg of the novel *Around the World in Eighty Days*, by the French author Jules Verne. Nellie Bly completed her trip in the record time of 72 days, 6 hours, 11 minutes. She wrote *Ten Days in a Madhouse* (1888) and *Nellie Bly's Book: Around the World in Seventy-two Days* (1890).

B'NAI B'RITH (Heb., "the Sons of the Covenant"), an organization founded in the United States in 1843 to further the unity of the Jewish people and to serve humanitarianism and community causes. Its program encompasses youth welfare, Americanism, defense of Jewish rights, social and community service, education, interfaith understanding, and philanthropy. The service agencies of B'nai B'rith include the Anti-Defamation League, which combats anti-Jewish prejudice; the Hillel Foundations, which serve numerous colleges and universities as cultural, religious, and social-welfare centers for Jewish students; the B'nai B'rith Youth Organization; the Vocational Service Bureau; and the National Post War Service-Americanism Department, a consolidation of the former Americanism and National War Service departments.

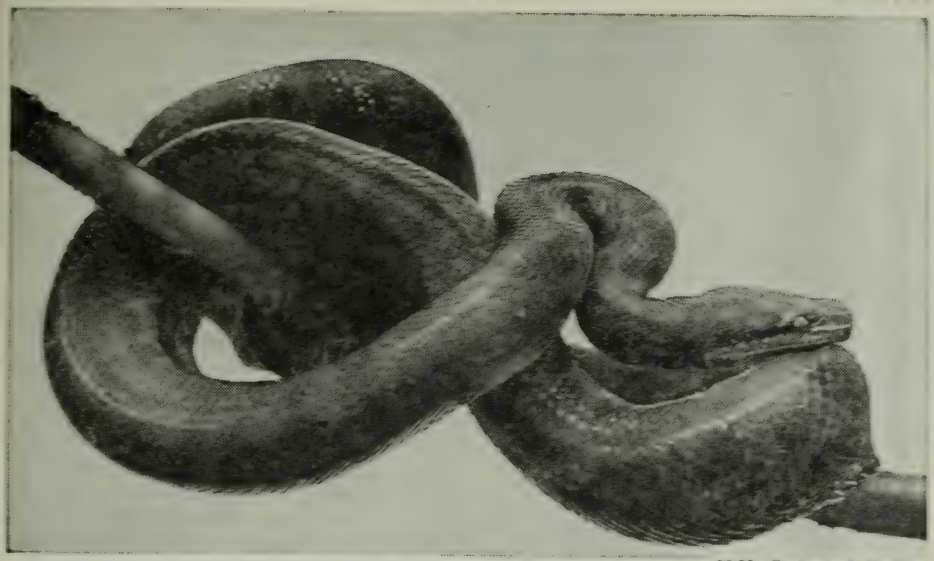
For its contributions to the war effort of the U.S., B'nai B'rith was awarded a U.S. Navy citation in December, 1945, and in February, 1946, was presented with a similar citation from the U.S. War Department. These citations were the first to be awarded to a national civilian organization. The American Jewish Conference was organized by B'nai B'rith in 1943 to unite the Jews of the U.S. on a common program for action in connection with Jewish postwar problems and the establishment of a Jewish Palestine.

In 1954 the total membership of B'nai B'rith in the U.S. and Canada was about 340,000 distributed in 1050 lodges, 625 women's chapters, and 1200 youth groups. Lodges are located also in about 30 foreign countries. Headquarters are in Washington, D.C. The official organ is the *National Jewish Monthly*.

BOA, name applied to a family, Boidae, of snakes, and specifically to a group of snakes and to a single snake within that family. The Boidae contain about twenty genera and seventy species. The name "boa" is best restricted to one of its two subfamilies, the Boinae; members of the other subfamily, the Pythoninae, are commonly called pythons (q.v.). Differences between the two subfamilies are technical and apparent only after dissection. With the exception of a single, rare, Mexican species, the pythons are confined to the Old World, whereas the boas have world-wide distribution.

All of the exceptionally large snakes of the world belong to this family, but not all boas and pythons are large. Certain species in each subfamily are no more than 2 to 3 feet in length when fully grown. All members of the family are characterized by the possession of well-developed hip bones and internal legs which protrude beside the vent as a pair of movable *spurs*. None of the snakes is venomous; all kill their prey by constriction, and a large specimen could undoubtedly kill a man in this way, although even the largest would probably be unable to swallow him. The name "boa constrictor" is properly applied only to a single species, described below.

The subfamily Boinae comprises thirteen genera. One of these, formerly called *Boa*, is now called *Constrictor* (the name *Boa* is now given to a different genus). The best-known snake of this genus is the boa constrictor, *Constrictor constrictor*, widely distributed in the jungles of Central and South America. Average length of the adult boa constrictor is 10 to 11 feet, although specimens as long as



N.Y. Zoological Society

Puerto Rican tree boa (Epicrates inornatus)

15 feet have been recorded. Stories of larger specimens may have arisen by confusion of this snake with the water boa (also called anaconda, q.v.), or with the pythons of Asia. The boa constrictor is reddish gray, with a longitudinal ladder of broad, dark stripes.

The tree boas, genus *Boa*, are arboreal and have strongly prehensile tails. Though nonvenomous, they have triangular heads, elliptical eye pupils, and long, curved front teeth, features typical of the poisonous vipers.

Some of the smaller boas, the sand boas and rubber boas, are found in s.w. United States. The latter are occasionally found as far north as Washington and Montana. These are predominantly burrowing animals, with blunt heads and blunt tails, and are sometimes called "two-headed" snakes.

BOABDIL or **ABU-'ABDULLAH,** called also El Chico ("the little") (d. about 1533), last Moorish king of Granada. He became king by dethroning his father Abu-al-Hasan in 1482, but the following year his forces were defeated by an army under King Ferdinand II of Aragon at Lucena, and he was taken prisoner. On Boabdil's agreement to become his vassal, Ferdinand restored him to the throne in 1486. Boabdil's rule was tyrannical, however, and led to a civil war in the capital city of Granada. Ferdinand took the city in 1492, after a siege, and despite a valiant defense by the Moors of their last stronghold in Spain. Boabdil retired to Fez, Africa, and was subsequently killed while fighting in the service of the king of Fez in a war with the king of Morocco.

BOADICEA or **BOUDICCA** (d. 61 A.D.), Queen of the Iceni, a British tribe inhabiting the territory comprising the present-day counties of Norfolk and Suffolk. On the death of her husband King Prasutagus about 60 A.D., the Romans seized her territory. The queen was scourged, her daughters were violated, and the noblest among the Iceni were treated as slaves. Boadicea gathered a large army, destroyed the Roman colony of Camulodunum (now Colchester), captured Londinium and Veralamium (London and St. Albans), and reputedly put to death as many as 70,000 Romans. Suetonius Paulinus, the Roman governor of Britain, who had been absent in Mona (Anglesey), advanced against the queen and destroyed her force of 200,000 men. In despair, Boadicea killed herself by poison. She has been the subject of various literary works by English authors, including the tragedy *Bonduca* by John Fletcher, the ode *Boadicea* by William Cowper, and the poem *Boadicea* by Alfred, Lord Tennyson.

BOAR. 1. The adult male of any species of the Swine (q.v.) family. Adult females are called sows. **2.** The wild boar, especially *Sus scrofus*, which originated in Europe and formerly ranged the entire continent, northern Africa, and western Asia. The European wild boar is grayish black in color and about 4 ft.

European wild boar

in length, with short, woolly hair interspersed with bristles forming a mane along the spine. Its lower teeth grow into formidable tusks. The boar usually makes its home in marshy forest land, feeding largely on roots and grain, though occasionally it kills and eats small animals. Boar-hunting was formerly a popular sport throughout Europe, but is now confined chiefly to central and eastern Europe, almost the only part of the continent where the animals are still abundant. In India a wild boar, *S. cristatus*, larger than its European relative, is hunted by horsemen with lances in the sport called "pig-sticking".

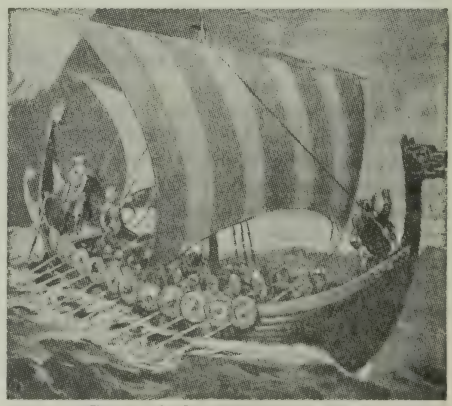
BOARHOUND, any large, powerful dog used to hunt boars; in particular, the Great Dane (q.v.). Dogs with heavy, rough coats are preferred for this sport, however, because they are less liable to sustain serious injury from the boar's tusks.

BOAS, FRANZ (1858–1942), German-American anthropologist and ethnologist, born in Minden, Germany, and educated at the universities of Heidelberg, Bonn, and Kiel. In 1883–84 he made a scientific exploration of the Baffin Land region. He was assistant at the Royal Ethnographical Museum in Berlin from 1885 to 1886, when he emigrated to the U.S. From 1888 to 1892 he was instructor in anthropology at Clark University, and was the first professor of anthropology at Columbia University from 1899 to 1937. He was also curator of ethnology at the American Museum of Natural History, New York City, from 1901 to 1905. Boas served as president of the American Anthropological Society in 1907–08, and of the New York Academy of Sciences in 1910. He was a world authority on the study of man's inheritance and environment and a specialist in languages, particularly those of the American Indians. He edited a *Handbook of American Indian Languages* (1911), and is the author of *Baffin's Land* (1885), *The Growth of Children* (1904), *Changes in the Form of Body of the Descendants of Immigrants* (1911), *The Mind of Primitive Man* (1911), *Anthropology and Modern Life* (1928), *General Anthropology* (1938), and *Race, Language, and Culture* (1940).

BOAT, name applied to a vessel used for carrying passengers or freight on the surface of the water. It is variously distinguished from the name "ship" in different types of usage, but in general the name "boat" is confined to small vessels, usually open, whether propelled by hand, sails, or engines. In the U.S. Navy the distinction, technically, is that "a boat may be taken aboard a ship", but the 300-ton, 80-foot vessels of the MTB (motor-torpedo-boat) class are called boats. In sailing vessels, technically, a boat is fore-and-aft rigged, whereas a ship is square-rigged; this distinction, however, is rarely applied.

The lowest portion of the inside of a boat, next to the keel, is called the *bilge*, and the fore-and-aft members at the tops of the boat's sides are called the *gunwales*. The seats for the crew which run from side to side are called *thwarts*, and the strip on which the thwart rests is called the *rising*. The space abaft (behind) the after thwart is called the *stern sheets*, and that forward of the foremost thwart, the *fore sheets*. The spaces for the oars are called *rowlocks*, and the place where the coxswain of a man-of-war boat sits or stands is called the *coxswain's box*.

Boats are generally classified, according to



Boat of the Viking warriors

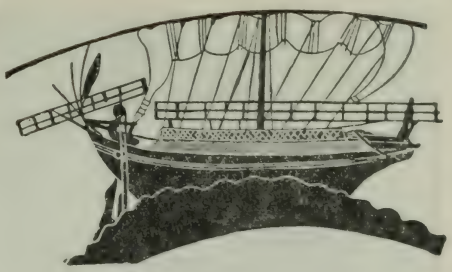
the shape of a section from side to side, as flat-bottomed, round-bottomed, or V-bottomed. In general, flat-bottomed boats are easiest to build, V-bottomed boats are fastest, and round-bottomed boats are best for sailing. Wooden boats are also classified according to their methods of construction: the *carvel*, with fore-and-aft planks, the edges meeting but not overlapping; the *clinker*, also with fore-and-aft planks, but with the edges overlapping each other; and the *diagonal*, with double planking running diagonally, the inside planks running in a direction perpendicular to that of the outside ones. See also SHIPS AND SHIPBUILDING.

The simplest form of vessel, sometimes excluded from the definition of the word "boat", is a *raft*, which may consists of nothing more than a few logs or planks lashed together. The small, collapsible, rubber boats used by aviators when forced to abandon their planes over water are also called rafts.

Among simple wooden boats are the *bateau*, a flat-bottomed boat, sharp and rising at both ends, used by the early French settlers in North America, and the *punt*, a flat-bottomed boat with square ends, used in England. Such boats are used in shallow, inland waters, and are frequently propelled by pushing on the bottom with a pole. The *dory* resembles a bateau, but, being intended for use in rough water, is deeper. Dories are used in great numbers by fishermen, being carried out to sea on large fishing vessels.

The term *canoe* (q.v.) is applied to a long, narrow, light, round-bottomed boat, sharp at both ends, and includes such diverse types as the kayak, dugout, and proa. A *whaleboat* is a long rowboat, similar to a canoe but heavier and deeper. *Cutters* are square-sterned boats, driven by oars, sails, or engines. A *dinghy* is a small cutter, driven by oar or sail, and a *launch* is a large cutter, driven by engines. However, terms such as dinghy and cutter may have special technical meanings with reference to sailboats. A *skiff* is a small rowboat or sailboat, usually with a flat bottom. A *wherry* is usually a small rowing or sculling boat, but the name was at one time also applied to a large barge. A *barge* is a large, flat-bottomed, shallow vessel, often little more than a raft, used for carrying freight. However, in U.S. Navy the term *barge* is applied to any boat used by an admiral, and the corresponding word *gig* is used for a captain's boat.

Boats carried aboard ships, when not in use, are hung from a special type of derrick called a davit. Some of these boats are designated lifeboats, but a lifeboat has no special type of construction and any type of boat may be so used; see LIFEBOAT. A sailboat or motorboat used primarily for pleasure purposes is called a yacht. See also NAVY; ROWING; SAIL; VESSELS, NAVAL; YACHTING.

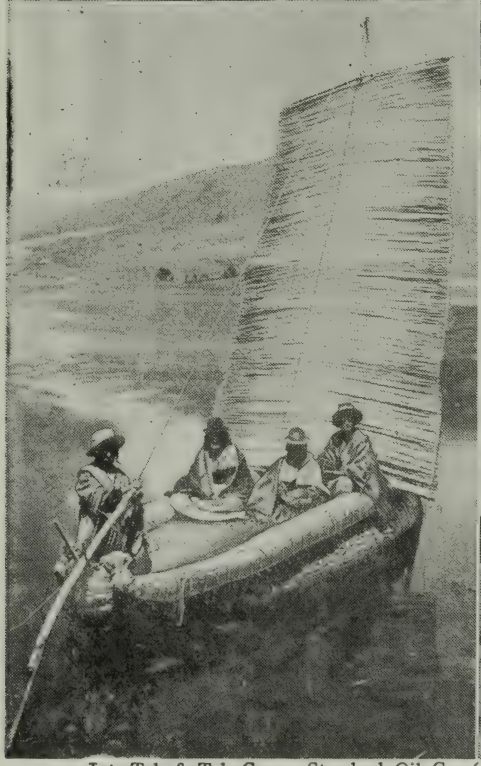


Ancient Greek vase painting of a merchant-type sailing boat

BOATBILL, common name for a small bird, *Cancroma cochlearia*, of the Heron family, having a short, broad bill which resembles an overturned boat. The bird is the size of a chicken, with shorter legs than most herons, and is generally rusty red in color, with a white forehead and breast. It feeds on small fish and amphibians, and is found in the Guianas and Brazil. A similar species, *C. zelendoni*, inhabits Central America.

BOATSWAIN, or BOATSWAIN BIRD, common name for either of two genera of sea birds with long, pointed tail feathers suggesting a marlinspike, formerly the boatswain's badge of office. In northern waters the name is usually given to various species of jaeger (q.v.); in warmer waters, it is given to several species of tropic birds (q.v.).

BOBADILLA, FRANCISCO DE (d. 1502), Spanish soldier and colonial administrator in America. In 1499 he was appointed to supersede the Genoese navigator Christopher Columbus as viceroy of the Indies (modern West Indies). He was specifically empowered to conduct an investigation of conditions prevailing on the island of Hispaniola. Shortly after his arrival at Santo Domingo, the Spanish settlement on Hispaniola, Bobadilla placed Columbus under arrest on charges of injustice to the Indians and shipped him back to Spain in chains. Bobadilla's administration was marked by great cruelty toward the Indians. Following the restoration of Columbus to favor, Bobadilla, in 1502, was recalled to Spain under arrest. His ship was wrecked in a hurricane and he perished at sea.



Int. Tel. & Tel. Corp.; Standard Oil Co. (N.J.); Grace Line; Virginia Conservation Comm.

Top, left: Chinese sampan, a flat-bottomed river boat, sometimes used as a houseboat.
Top right: Peruvian fishing boat used in trawling for tuna off the northwest coast of Peru.
Bottom, left: Indians in a boat made of balsa, on Lake Titicaca, South America.
Bottom, right: Sailing skiffs on a pleasure cruise, on the Rappahannock River, Virginia.

BOBCAT, alternate name for certain lynxes of North America, particularly the wildcat or bay lynx, *Lynx rufus*, so called because of its short or "bobbed" tail. See LYNX.

BOBOLINK (formerly called BOBLINCOLN or BOB O' LINCOLN, in imitation of its call), common name for a song bird of North America, *Dolichonyx oryzivorus*, of the Blackbird family (q.v.). It is distinguished from other members of the family, the blackbirds and orioles, by its long middle toe and its pointed tail feathers. Bobolinks breed in fields and meadows in the northeastern parts of North America during late spring and early summer. They build nests of grass, and lay about five marbled-white eggs. During the breeding season the plumage of the adult male is generally black, with tan nape and shoulders, and ashy black and tail coverts. In this plumage, he is called skunk blackbird. The female is streaked brown above and tan below. At the end of the summer the male undergoes an autumn molt and the plumage becomes similar to that of the female. In the autumn the birds migrate through southern U.S. (where they are known as reedbirds or ricebirds) and through the West Indies to South America, where they spend the winter south of the Amazon River.

BOBRUISK, capital of the Region of the same name, Byelorussian (White Russian) Soviet Socialist Republic, situated on the Beresina R., 90 miles S.E. of Minsk. The city is connected by steamer with towns on the Dnieper and Beresina rivers, and is on the railroad from Minsk to Gomel. An important shipping point for corn and timber, the principal manufactures of the city are iron and flour. Bobruisk is the site of a college and a military hospital. Fortified in the first years of the 19th century, the city withstood the attacks of the French under Emperor Napoleon I in 1812. It was in the fighting zones of both World War I and World War II. Pop. (1939) 84,107.

BOBSLEDDING, competitive winter sport in which two- or four-man teams descend a steep, icy run on a bobsled. A typical bobsled consists of two small sleds connected by a semiflexible steel platform. The crew sits on the platform. Steering is accomplished by means of a rope or wheel attached to the front sled. Most racing bobsleds are equipped with brakes and have a streamlined aluminum cowl mounted on the front end. Racing sleds have been clocked at speeds up to 118 m.p.h., but speeds generally average from 60 to 70 m.p.h.

The captain of a bobsled team occupies the front position and steers the sled; the man in the rear position operates the brake. On four-man sleds an important function of the two center men is to help "bob" the sled. To "bob" their vehicle, the three crew members lean backward at an extreme angle, then snap forward in unison. This action, which gives bobsledding its name, sharply accelerates the speed of the sled.

Bobolink

Bobsled runs are twisting courses laid out on hillsides or on artificial slopes. The best-known bobsled course in the United States is the Mount Van Hoevenberg run in Lake Placid, N.Y. This specially designed run is 1½ miles long and has an angle of descent ranging from 8½ to 15 degrees and a surface consisting of glare ice coated with hard-packed snow. It has 26 turns, some of which are 30 feet high and have almost vertical walls. The Mount Van Hoevenberg run and that in St. Moritz, Switzerland, are considered the fastest in the world.

The rules of international bobsledding competition are set by the International Federation of Bobsledding and Tobogganing (F.I.B.T.). Under F.I.B.T. rules bobsled competitions are won by the team which posts the fastest aggregate time for four descents of the course. The F.I.B.T. sponsors world,

Olympic, and various national bobsledding championships in both the two-man and four-man classes.

Bobsledding first became popular as a sport in St. Moritz, Switzerland, late in the 19th century. The first organized bobsled competition was held in St. Moritz in 1898, and the first European championship contest took place in 1914. Bobsled teams competed in the first Winter Olympics in 1924, and the event was included regularly in the games thereafter. More than sixty bobsled runs were in use in Europe immediately prior to World War II. One of the fastest and most exhilarating of sports, bobsledding sometimes is called "The Champagne of Thrills".

BOBWHITE. See QUAIL.

BOCCACCIO, GIOVANNI (1313–75), Italian writer, born in Paris, the illegitimate son of Boccaccio di Chellino, a Florentine merchant, and a French noblewoman. Reared in Florence, Boccaccio was sent about 1323 to study accounting in Naples. He abandoned accounting for canon law, and this for classical and scientific studies, and took part in the gay life of the court of Robert d'Anjou, King of Naples. The illegitimate daughter of Robert, Maria de Conti d'Aquino, became his mistress and inspired a great deal of his work; she is immortalized in his writings as "Fiammetta".

About 1340 Boccaccio settled in Florence, where he performed various diplomatic services for the government of the city and met the celebrated Italian poet Petrarch, with whom he kept a close friendship until Petrarch's death in 1374. In 1362 Boccaccio was invited to Naples by a friend, who promised him the patronage of Queen Joanne of that city. A cold reception at the queen's court led him to seek the hospitality of Petrarch, who was then in Venice (1363). Rejecting Petrarch's offer of a home, however, he returned to his Certaldo estate. His last years, in which he turned to religious meditation, were brightened by his appointment as lecturer on the Italian poet Dante Alighieri in Florence in 1373, but his series of lectures was interrupted by illness in 1374, and Boccaccio died the next year.

His most important work is the *Decameron* (q.v.), written between 1348 and 1353. This witty and high-spirited collection of tales, the first prose masterpiece of the Italian Renaissance, holds a high place in world literature, and has established Boccaccio as one of the greatest writers of all time. It is especially notable for the richness and variety of its narratives, the brilliance of its craftsmanship, and the penetrating insights into character which it contains. Among Boccaccio's other writings are the prose romances *Il Filicopo* (1331–38) and *Il Corbaccio* (about 1354); the tales in verse *Il Filostrato* (about 1338) and *La Teseide* (about 1341); the pastoral romance *L'Amorosa Fiammetta* (about 1341); a life of Dante, with commentary on Dante's *Divina Commedia*; and a number of scholarly, scientific, and poetic works in Latin. Among famous writers who used Boccaccio's works as source material are the English authors Geoffrey Chaucer and William Shakespeare.

BOCCHERINI, LUIGI (1743–1805), Italian violoncellist and composer, born in Lucca, and trained in Rome. He became chapel composer of Infante Don Luis at Madrid, Spain, afterward holding a similar post under King Fredrick William II of Prussia. Boccherini was one of the earliest of the great violoncello virtuosi of modern times. His music is marked by great elegance and refinement of style. He wrote 366 instrumental works, mostly trios, quartets, and quintets for strings. In the majority of these works the violoncello part is especially prominent, and certain of Boccherini's compositions for that instrument, notably his *Concerto* for violoncello and orchestra, have become part of the repertory of all modern violoncellists.

BOCHOLT, town of North Rhine-Westphalia, West Germany, 35 miles W. of Münster, and near the Dutch border. It is a center of the cotton industry of North Rhine-Westphalia. Other leading industries are the manufacture of leather, iron, and trimmed lumber. Pop. (1950) 37,662.

BOCHUM, city of North Rhine-Westphalia, West Germany, 9 miles E. of Essen. Lying in the Ruhr industrial region, Bochum is a center of the iron, steel, and coal industry of North Rhine-Westphalia. Industrial establishments include steel works, foundries, and plants engaged in the manufacture of tin and zinc ware, carpets, calcium carbide, and paper roofing. Bochum is the site of a school of mining and metallurgy. Pop. (1950) 289,804.

BODANZKY, ARTUR (1877–1939), Austrian conductor, born in Vienna, and trained at the Vienna Conservatory. He began his career as violinist, but soon obtained a position as conductor, and directed orchestras in Vienna, Berlin, Prague, and other European cities. In 1914 he conducted the first performances of the music drama *Parsifal*, by the German composer Richard Wagner, at Covent Garden, London; the Italian operatic manager Giulio

Gatti-Casazza was so impressed with his ability that he engaged him as conductor at the Metropolitan Opera House in New York City. This position Bodanzky held until his resignation in 1929. He was also conductor of the Society of the Friends of Music. From 1919 to 1921 he led the concerts of the National Symphony Orchestra, and after the amalgamation (1921) of the latter organization with the New York Philharmonic Society, he directed several Philharmonic concerts as guest conductor. Bodanzky revised the scores of the operas *Oberon* and *Freischütz* by the German composer Karl Maria von Weber and *Fidelio* by the German composer Ludwig van Beethoven, setting to music all the spoken dialogues. These new versions were presented at the Metropolitan Opera House under his direction.

BODE, JOHANN ELERT (1747–1826), German astronomer, born in Hamburg. In 1772 he became astronomer of the Academy of Sciences in Berlin and in 1786 director of the Berlin Observatory. His fame rests chiefly on the *Uranographia* (1801), in which he catalogued 17,240 stars, 12,000 more than were included in any previous chart. Bode reproduced the statement of the relations of the planetary distances, a law previously discovered by the German mathematician Johann Daniel Titius (1729–96), but afterward called Bode's law (q.v.).

BODEN SEE. See CONSTANCE, LAKE.

BODE'S LAW, an arithmetical relation supposed to establish a connection between the distances of the planets from the sun. It was first discovered by the German mathematician Johann Daniel Titius (1729–96) of Wittenberg in 1766, but was first published by the German astronomer Johann Elert Bode in 1772. The law states that the relative distances are in the proportions 4, 7, 10, 16, 28, 52, 100, 196; this series of numbers is derived by adding 4 to each member of the series 0, 3, 6, 12, 24 . . . At the time of its discovery, only six planets were known, and the numbers closely fitted the observed facts. The discovery of Uranus in 1781 and of the first asteroid in 1801, corresponding closely with the missing numbers 196 and 28, lent considerable support to the theory. However, the positions of the more recently discovered planets Neptune and Pluto deviate widely from those (388 and 772) predicted by Bode's law, and since there is no theoretical basis for the law, astronomers now believe that the relationship is a coincidence.

BODIERON, common name for the green rock trout, *Hexagrammos decagrammus*, of Puget Sound and northward, and known to Cape Flattery Indians as tsebarqua. It resembles other rock trout (q.v.), but its flesh is greenish in color.

BODLEIAN LIBRARY, the library of Oxford University, England, restored by the English scholar and diplomat Sir Thomas Bodley in 1602. The original library had been destroyed about the middle of the 16th century in the reign of King Edward VI, and was formally reopened in 1603, receiving letters patent and its name from King James I in 1604. Bodley presented the library with a collection of books, purchased on the Continent at an expense of £10,000. Among subsequent benefactors were the English notables William Herbert, Earl of Pembroke, who presented 250 volumes of valuable Greek manuscripts; Sir Thomas Roe; Sir Kenelm Digby; Robert Burton, author of the *Anatomy of Melancholy*; and Archbishop William Laud, who made a donation of 1300 manuscripts in 20 languages. The library is especially rich in Biblical codices, rabbinical literature, and materials for British history, and ranks first in Europe and probably in the world in Far Eastern literature. With the British Museum, it enjoys the right of receiving a copy of every book published in England. The Bodleian collections include more than 1,750,000 bound volumes and 40,000 volumes of manuscript, besides valuable pictures and relics. Students at Oxford University pay a fee for the use of the library at the time of their matriculation, and members of Oxford University who have received a degree are allowed to use the library for an additional fee. Literary men, properly recommended, are allowed to make extracts from its works. Connected with the main library is a circular structure, called the Camera Bodleiana, used as a reading room.

BODONI, GIAMBATTISTA (1740–1813), Italian printer and type designer, born in Saluzzo, Piedmont. Appointed by the infante Don Ferdinand, later duke of Parma, to manage a printing house in the duchy of Parma, he supervised the publication of elegant editions of the *Iliad*, by the ancient Greek poet Homer, and of other Greek, Latin, French, and Italian classics, as well as a celebrated edition of the Lord's Prayer in 155 languages. He was the designer of the first modern, Roman-style type face, Bodoni Book.

This is Bodoni type.

BOEHLER, PETER (1712–75), Moravian bishop, born in Frankfurt-am-Main, Prussia, and educated at the University of Jena. He was ordained in 1737, and was sent as a missionary to the American colonies of the Carolinas and Georgia. Boehler worked among the Negroes in Georgia and among the Germans in South Carolina, some of whom he resettled in Bethlehem, Pa. For a year he served as missionary to the American Indians. On his return from a trip to Europe he brought with him a large number of Moravian colonists, and he subsequently founded the village of Nazareth, near Bethlehem. In 1742 Boehler was appointed bishop of the Moravian churches of America, England, Ireland, and Wales.

BOEHMERIA, genus of plants in the Nettle family. They are perennial herbs with broad, ovate leaves, white and downy beneath, and are generally similar to other nettles, but without stinging hairs. The flowers grow on spikes. A single species, bog hemp, *B. cylindrica*, is native to the U.S., but plants of this genus grow in many parts of the world. In some localities China grass, *B. nivea*, is cultivated for ramie, a fiber obtained from the stems; see RAMIE.

BOELL, EDGAR JOHN (1906–), American zoologist, born in Rudd, Iowa, and educated at the universities of Dubuque and Iowa and at Cambridge University, England. He became instructor in biology at Yale University in 1938, was made full professor in 1946, and professor of experimental zoology in 1947. He wrote many articles on subjects in his field of microchemical methods, including the biochemistry of embryology, metabolism of protozoa, and bioelectric potentials.

BŒOTIA, in antiquity, a republic of Greece, bounded on the N. by Locris Opuntia, on the E. by Atalante Channel and Evripos (strait), on the S. by Attica, Megaris, and the Gulf of Corinth, and on the W. and N.W. by Phocis. The region occupied by ancient Bœotia now forms part of the Greek department of Attica and Bœotia. An Æolic people, the Bœotians originated in Thessaly. They excelled as cultivators of the soil and were good soldiers, both on foot and on horseback. Their country was highly productive, abounding in fertile fields, excellent pasturage, and various minerals. Bœotia emerged as a significant Greek state about 600 B.C. At that time Thebes, the chief Bœotian city, succeeded in forming the Bœotian League, a confederation of fourteen city states, including Orchomenus and Thespiæ. Hostile relations between the Bœotian League and Athens finally led to a general conflict, which terminated in an Athenian victory (457 B.C.) and in the destruction of the confederation. In 447 B.C. the Bœotians led a successful revolt against Athens, and the confederation was re-established. The League sided with Sparta during the Peloponnesian War (431–404 B.C.). In 424 B.C. the Bœotian army inflicted a severe defeat on the Athenians at Delium. The Theban general Epaminondas led the League's army to a decisive victory over the army of Sparta at Leuctra in 357 B.C. From that time until 338 B.C., when the Macedonian king Philip II defeated a combined army of Thebans and Athenians at Chæronea, Bœotia dominated Greece. The destruction of Thebes by the Macedonian king Alexander III (the Great) brought the republic's political power to an end.

BOERHAAVE, HERMANN (1668–1738), Dutch physician, born near Leiden, and educated at the universities of Leiden and Harderwyk. In 1701 he became lecturer on the theory of medicine at the University of Leiden, and in 1709 professor of medicine and botany. The two works on which his fame chiefly rests are *Institutiones Medicæ* (1708) and *Aphorismi de Cognoscendis et Curandis Morbis* (1709).

BOERS (Du. *boer*, "farmer"), those inhabitants of South Africa descended from the Dutch settlers who founded Cape Colony in 1652, and from French Protestants who settled in the colony about 1687 and subsequently intermarried with the Dutch settlers. The strict Calvinism of the Boers and their conflicts with the natives and with the despotic Dutch East India Company, which governed the colony, developed in them a spirit of stubborn independence. In 1814 the Netherlands ceded Cape Colony to Great Britain, and a period of friction between the Boers and the British began. After the British freed the slaves of the Boers in 1834, the Boers decided to place themselves beyond British authority. From 1835 to 1840, about 7000 of them emigrated north in a movement known as the Great Trek. They, and additional emigrants who came later, established a number of settlements which subsequently merged into three states: Natal; the Orange Free State; and the Transvaal (qq.v.), or South African Republic. To maintain these states the Boers fought a number of wars with the native Kaffirs and Zulus, and with the British, who claimed jurisdiction over the new Boer colo-

nies. The British annexed Natal to their Cape of Good Hope Colony in 1844; recognized the independence of the Orange Free State in 1854; and annexed the Transvaal in 1877. After the war of 1880–81 between the British and the Boers, a period of peaceful relations was initiated, and the Transvaal was given a semi-independent government. However, the discovery of gold in the Transvaal (1884) and the influx of foreigners, whose rights and privileges the Boers curtailed, led to new friction between Boers and British. The question of national primacy in South Africa finally came to a head in 1899, and was decided by the British victory in the South African War (q.v.), waged between 1899 and 1902. As a result of this war, in 1902 the British annexed the Orange Free State, and in 1910 they combined this colony and the Transvaal with Natal and Cape of Good Hope Colony to create the Union of South Africa (q.v.).

BOER WAR. See SOUTH AFRICAN WAR.

BOETHIUS, ANICIUS MANLIUS SEVERINUS (480?–524? A.D.), Roman statesman and philosopher. He gained the esteem and confidence of Theodoric, King of the Ostrogoths, then the ruler of Rome, and in 510 was made a consul. Later Boethius was accused by enemies of plotting treason, and, though innocent, was imprisoned at Pavia and executed. During his imprisonment he wrote *De Consolatione Philosophiae*, a philosophic work which, though written by a non-Christian, contained so many elements of Christian ethics that it was highly regarded in Europe during medieval times. Many translations of the work were made, notably (in England) by King Alfred the Great and by the poet Geoffrey Chaucer. Boethius is also the author of treatises on logic which profoundly influenced the terminology of medieval logic; translations and commentaries on the works of the Greek philosopher Aristotle from which medieval scholars largely derived their knowledge of Aristotle; and works on music, arithmetic, and theology.

BOG, an area of moist, soggy ground, usually underlain with a deposit of peat (q.v.) formed by the decay and carbonization of mosses and other vegetation in the bog. The process of bog formation is continuous, with new crops of reeds and mosses growing over the debris of earlier generations. Thus the surface of a bog is gradually elevated, and if the bog becomes oversaturated with water it may burst, deluging nearby fields with mud.

Bogs are characteristic of the colder temperate climates and are found particularly in northern Europe, Ireland, northern U.S., and parts of Canada. In Ireland, where they are especially numerous, they sometimes reach a depth of 40 ft. Organic material decays slowly in peat, and remains of prehistoric animals are often found in the depths of peat bogs.

BOGALUSA, city of Washington Parish, La., about 80 miles E.N.E. of Baton Rouge. Its chief industry is the manufacture of wooden and paper products. Bogalusa is the site of the State University Forest School. Some 15 miles S.W. of the city, which was founded by the Goodyear Tire and Rubber Company in 1906, is the Goodyear Plantation of about 12,000 acres. About half of the acreage is planted with Chinese tung trees, grown for their valuable oil. Pop. (1950) 17,798.

BOGARDUS, EMORY STEPHEN (1882–), American sociologist, born near Belvidere, Ill., and educated at Northwestern University and the University of Chicago. In 1911 he became professor of sociology at the University of Southern California, and from 1945 to 1949 he was dean of the graduate school of that institution. Bogardus served as president of the American Sociological Society in 1931. He edited numerous scholarly publications, among them the *Journal of Applied Sociology* from 1921 to 1927 and thereafter the *Journal of Sociology and Social Research*. His works include *The Development of Social Thought* (1940), *Democracy by Discussion* (1942), *Dictionary of Cooperation* (1943), *Principles of Cooperation* (1949), and *The Making of Public Opinion* (1951). He is the editor of *Graduate Studies in a World Reborn* (1945).

BOG ASPHODEL, common name for a plant of the genus *Narthecium* in the Lily family. Its common and scientific names are both derived from its resemblance to the true asphodel (q.v.), a plant of the same family, inasmuch as *Narthecium* is an anagram of *Anthericum*, the ancient name of the asphodel. *N. americanum*, common in New Jersey bogs and pine barrens, and *N. ossifragum* of Europe are similar plants, growing about 1 foot in height, with yellow flowers in dense racemes blossoming in early summer.

BOG BIRD or **BOG SUCKER,** name for the woodcock (q.v.).

BOGERT, MARSTON TAYLOR (1868–1954), American chemist, born in Flushing, N.Y., and educated at Columbia College. He joined the faculty of Columbia in 1894, became full professor in 1904, and professor emeritus in

1939. He was president of the American Chemical Society, the Society of Chemical Industry (England), and the Chemists' Club, and chairman of the chemical section of the National Academy of Science. During World War I he was chief of the Chemical Service Section of the U.S. Army, with the rank of colonel. For his achievements in the field of synthetic organic chemistry he received many honors, including the Medal of the American Institute of Chemists in 1936 and the Priestley Medal of the American Chemical Society in 1938.

BOGHAZKEUI, BOGAZKÖY, or **HATTUSHASH** (Gr. *Pteria*), village of Ankara Il, Turkey in Asia, about 150 miles S. of Sinop. Its site was occupied by several ancient cities, including Pteria, a city of ancient Cappadocia (q.v.), and Hatti, capital of the Hittite Empire (see HITTITES) in the 2nd millennium B.C. According to the Greek historian Herodotus, Pteria was the scene of a defeat inflicted (6th century B.C.) by King Croesus of Lydia on the Persian king Cyrus the Great. The region surrounding the village contains numerous ruins, including those of a vast temple. Archeological discoveries made in the vicinity after 1906 include approximately 10,000 cuneiform documents which have provided valuable data regarding the high degree of civilization prevailing in the Hittite Empire. Pop. (1945) 929.

BOG JUMPER. See BITTERN.

BOG MOSS. See SPHAGNUM.

BOG MYRTLE. See SWEET GALE.

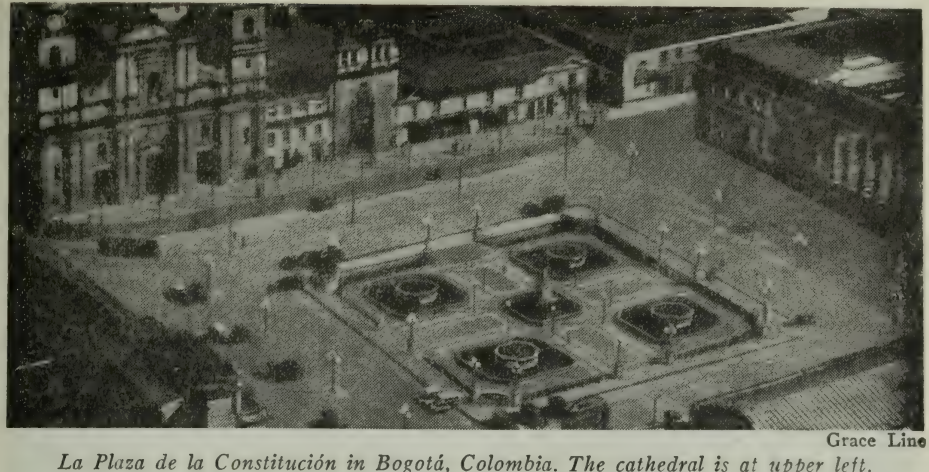
BOGOMILS, members of a religious sect which arose about the 9th century. Its chief center was in Bulgaria, but the cult spread, especially among the Slavic races. The basis of the creed was as follows. God's first-born son was Satanael, who was at first good; he afterward rebelled and created, in opposition to the original spiritual universe, a world of matter and human beings. These human beings, however, received from the Supreme Father a life spirit; this was kept in slavery by Satanael until a second son of God, the Logos or Christ, came down from heaven and, assuming a phantom body, broke the power of the evil spirit, who was henceforth called only Satan, the divine name, *El*, being dropped. The Bogomils practiced a severe asceticism, despised images, and rejected the sacraments. They accepted the whole of the New Testament, but of the Old Testament only the Psalms and Prophets, which they interpreted allegorically. Their morality was high, and their ideals of life seem to have been much above the average of their time. In 1118 the Byzantine emperor Alexius Comnenus executed their leader for heresy, but the creed survived, and at the time of the Mohammedan conquest of Bosnia (15th century) the majority of the Christians who embraced the religion of the conquerors belonged to this sect.

BOGOR. See BUITENZORG.

BOGOS, Ethiopian tribe, numbering about 10,000, inhabiting the highlands in the E. around Cheren. Its members speak a Hamitic language called Bilin, which is related to Agau. They are a nomadic, pastoral people, with olive-brown complexions. Once nominally Christians, the Bogos are now mostly Moslems. Their territory was for a long time an object of dispute between Egypt and the Ethiopian kings.

BOGOTÁ, capital of the republic of Colombia and of Cundinamarca Department, situated on a plateau (8563 ft. above sea level), in the eastern cordillera of the Andes Mountains. The city, sometimes called the "Athens of South America", is rhomboidal in shape and regularly laid out, with well-paved streets intersecting at right angles. Two mountain streams traverse the city, dividing it into four sections. Around Plaza de la Constitución, the principal square, are the cathedral, a magnificent edifice in the Corinthian style, the Capitol, and several other government buildings. Other noteworthy structures are the public library, the National Observatory, and the National University (founded in 1572). The city also contains a botanic garden and a museum of natural history. Among the industries of Bogotá are flour milling, brewing, and the manufacture of shoes, textile products, cigarettes, furniture, soap, chocolate, and cement. The region N. and E. of the city is rich in coal, iron, limestone, sand, manganese, and fire clay. At Zipaquirá, N. of Bogotá, are highly productive salt mines.

Before the Spanish conquest of South America, Bacatá, one of the chief towns of the native Chibcha (q.v.) people, was located on the site of the present city. In 1538 the Spanish conquistador Gonzalo Jiménez de Quesada founded there Santa Fé de Bogotá, named after Santa Fé, his native town, and Bacatá. It became capital of the Spanish viceroyalty of Nueva Granada and one of the leading cities of the Spanish colonies in America. The residents of Bogotá participated in the revolt against Spanish rule in 1811, and in 1831 the city became capital of the new Republic of New Granada, comprising the present republics of Colombia, Ecuador,



Grace Line

La Plaza de la Constitución in Bogotá, Colombia. The cathedral is at upper left.

Venezuela, and Panama. Its subsequent history is essentially that of Colombia (q.v.). In April, 1948, while the Ninth Inter-American Conference was in session at Bogotá, the city was severely damaged in the course of a revolutionary uprising. Pop. (1951) 643,187.

BOGUSLAWSKI, Wojciech (1759?–1829), Polish actor and playwright, born in Glinno. In 1790 he was appointed director of the Royal Theater in Warsaw, at which he established a school of dramatic instruction. He is regarded as the founder of a Polish national drama, to which he contributed a large number of translations and original works. He also introduced opera into Poland. A complete edition of his dramas, chiefly comedies, was published in Warsaw (9 vols., 1820–25).

BOHADDIN. See Baha al-Din.

BOHEMIA (Czech. *Čechy*; *Ger. Böhmen*), former province of Czechoslovakia, comprising after January 1, 1949, eight administrative units, known as Regions, namely Prague, České Budějovice, Plzeň, Karlovy Vary, Ústí, Liberec, Hradec Králové, and Pardubice. Prague, the former provincial capital, is the chief Bohemian city. Other important cities are Plzeň, České Budějovice, and Pardubice. Considered as a geographic entity, Bohemia is bounded on the N.W. and S.W. by Germany, on the N.E. by the territory formerly comprising Moravia-Silesia, and on the S. by Austria. Bohemia is surrounded by lofty mountain ranges, notably the Riesen Gebirge, which attains a maximum elevation (Schneekoppe) of 5266 ft.; the Erz Gebirge, the highest peak of which is Keilberg (4080 ft.); and the Bohemian Forest (Ger. *Böhmer Wald*), with elevations up to 4780 ft. These mountain chains consist largely of primitive rocks, principally gneiss, mica-slate, and granite. A remnant of volcanic action, of which traces are common, still continues in the eruptions of carbonic-acid gas which have created mineral springs in many parts of Bohemia, notably at Karlovy Vary (Karlsbad), Marianské-Lázně (Marienbad), Teplice-Šanov (Teplitz), and Cheb (Eger). The principal rivers traversing Bohemia are the Elbe (known locally as the Labe) and a number of its affluents, including the Vltava (Moldau) and the Ohře (Eger).

Bohemia is rich in minerals, and has fertile plains. Coal, iron, copper, silver, lead, uranium, tungsten, antimony, and precious stones are mined. The chief agricultural products are grains, sugar beets, hops, flax, and fruits. Bohemia is also famous for its industries, of which brewing and glassmaking are the best known. The brews of Plzeň (Pilsen) and České Budějovice (Budweis) are world famous. Bohemians have been among the most skillful craftsmen in fine glassware since the 17th century. Textiles, shoes, chemicals, porcelain ware, electric equipment, machines, and tools are among the other important products of modern Bohemia.

The majority of the inhabitants of Bohemia are Czechs, who speak a Slavonic language. Considerable numbers of Germans settled in the border regions from the 13th century on, but after the liberation of Czechoslovakia from German domination during World War II, most of the German inhabitants were forcibly removed from Czech soil and deported to Germany.

The country derives its name from the Boii, a Celtic people. The Boii were expelled by

Czechoslovak Govt. Info. Service

Tabor, in southern Bohemia, historical center of the Hussite religious movement

the Marcomanni, a Germanic tribe, about the beginning of the Christian era. From 1310 to 1437 the country was ruled by kings of the House of Luxemburg. During the reign (1378–1419) of King Wencelaus IV, who was also Holy Roman emperor, the Bohemian religious reformers John Huss and Jerome of Prague challenged the authority and teachings of the Church hierarchy at Rome. With the king's encouragement the reform movement, historically the inception of the Protestant Reformation on the Continent, gained headway in Bohemia. The accession (1419) to the Bohemian throne of Wencelaus' brother Sigismund, an enemy of religious reform, precipitated a general rebellion. Pope Martin V proclaimed a crusade against the Bohemian rebels in the following year, bringing on the conflict known as the Hussite Wars (q.v.). The Bohemians repeatedly repulsed the interventionary armies, but in 1434 doctrinal differences among the Hussites (q.v.) culminated in a sanguinary internecine war. As a consequence the Bohemians were forced to accept (1436) a compromise agreement with the Church. Most of the fundamental political and religious issues involved in the struggle remained unsolved. However, the Hussite movement stimulated nationalist sentiments among the Bohemians, thereby checking the previous trend toward Germanization of the nation.

In 1458 the able Protestant noble George of Podiebrad ascended the throne. His successor, the Polish prince Ladislas, who was crowned as Ladislas II in 1471, was elected (1490) to the throne of Hungary, and moved the royal residence to Ofen, where his son and successor, Louis, also resided. After the death (1526) of Louis in battle against the Turks at Mohacz, Bohemia and Hungary passed into the hands of Ferdinand I of Austria, who had married Louis's sister. From that time the history of Bohemia merges with the history of Austria. The Reformation was tolerated under Maximilian, and religious liberty formally granted by Rudolf II (1609). The withdrawal of this freedom a few years later during the reign of Matthias led to the outbreak of the Thirty Years' War (q.v.) and to election of Frederick V of the Palatinate as Bohemian king. The battle at the Weissenberg (1620) restored the Hapsburgs, and was followed by the merciless extirpation of Protestantism, the suppression of all national

privileges, and the ruin of the country. The reforms of Joseph II (reigned 1765–90) stirred up in Bohemia a revival of nationalism; and after 1848, when a nationalist rebellion was swiftly suppressed, there was a constant struggle for Czech autonomy within the Austro-Hungarian Empire. With the collapse of that empire after World War I and the establishment of the Czechoslovak Republic in 1918, the history of Bohemia as a state was identified with that of the new republic of which it became a province (see CZECHOSLOVAKIA). Area of former province, 20,101 sq.m.; pop. (1947 est.) 5,503,000.

BOHEMIAN BRETHREN, religious society, established in Prague about the middle of the 15th century, and originally composed of remnants of the Hussites (q.v.). In 1453 they settled on the borders of Silesia and Moravia. They migrated again in 1722, and settled in the village of Herrnhut in Saxony, on the estates of the religious reformer Count Nikolaus Zinzendorf. For later history, see MORAVIANS.

BOHEMIAN FOREST (Ger. *Böhmer Wald*; Czech. *Český Les*), mountain range between Bavaria and Bohemia. The range is about 125 m. long and from 20 to 40 m. wide, and covers an area of about 4400 sq.m. It is thickly covered with forests and abounds in picturesque scenery. The highest summits, found in the Bavarian section, exceed 4700 ft.

BOHEMIAN LANGUAGE AND LITERATURE. See CZECH LANGUAGE AND LITERATURE.

BOHEMUND, name of several princes of Antioch and counts of Tripoli. The most important was BOHEMUND I (d. 1111), the eldest son of Robert Guiscard, the Norman duke of Apulia and Calabria, born some time between 1052 and 1060. He distinguished himself in the war (1081–85) carried on by his father against the Byzantine emperor Alexius Comnenus. Robert Guiscard died in 1085, leaving his property to his younger son, Roger. Bohemund waged war on the latter until 1089, when a peace was made by which Bohemund received a part of Apulia. When the First Crusade was preached, Bohemund saw in it an opportunity for extending his possessions. As long as he remained with the crusaders, Bohemund was their leader in fact, although he was not officially recognized as such. Antioch was captured in June, 1098, and Bohemund received it as a principality. He was captured by the Moslems in 1100, and was held prisoner until 1103. After suffering a great defeat in the following year, he returned to western Europe to seek aid, and, while in France, married Constance, the daughter of King Philip I. By 1107 he was head of a large army of adventurers, who had been attracted by his renown, but, instead of returning to Antioch, he led his forces against the Byzantine Empire, which had restricted the expansion of his principality since 1098. His attack was unsuccessful, and Bohemund was forced to accept a peace which made him a vassal of the Byzantine emperor.

BÖHM-BAWERK or **BÖHM VON BAWERK,** EUGEN (1851–1914), Austrian economist and statesman, born in Brünn, and educated at the universities of Vienna, Heidelberg, Leipzig, and Jena. He became a lecturer at the University of Vienna in 1880, and later joined the faculty of the University of Innsbruck, at which he became professor in 1884. He served as finance minister of the Austrian government in 1895, in 1897–98, and from 1900 to 1904. In 1911 he was elected president of the Austrian Academy of Science. One of the founders of the "Austrian School" of political economy, he developed a theory of value, based on the final utility concept, which deeply influenced the economists of his time. He also made a critical analysis of the leading theories of capital and interest. His works include *Kapital und Kapitalzins* (in 2 parts, 1884–89), *Recent Literature on Interest* (1884–89), *The Positive Theory of Capital and Its Critics* (1895), and *Karl Marx and the Close of His System* (1898).

BOHMER WALD. See BOHEMIAN FOREST.

BOHOL, one of the Visayan group of islands of the Philippines, situated between the islands of Cebu on the N.W., Leyte on the N.E., and Mindanao on the S. With small neighboring islands Bohol forms the province of Bohol, Republic of the Philippines. The island of Bohol is generally mountainous and the northern and western coasts are bordered by reefs. It contains deposits of gold, copper, phosphate, coal, and iron, and numerous mineral springs. The chief industry is the weaving of silk and cotton fabrics and blankets. The capital of the province is Tagbilaran (pop., about 15,600). Area of province, about 1575 sq.m.; pop. (1948) 553,407. Area of Bohol Island, 1492 sq.m.; pop. (1939) 449,549.

BOHOR, an antelope, one of the larger reitboks. It ranges in East Africa from Ethiopia to Rhodesia. See REITBOK.

BOHR, NIELS HENRIK DAVID (1885–), Danish physicist, born in Copenhagen, and educated at the University of Copenhagen. He went to England in 1911 and studied atomic physics under the English physicists Sir Jo-

seph John Thomson and Ernest Rutherford. His theory of atomic structure (see ATOM AND ATOMIC THEORY), for which he received the Nobel Prize in physics in 1922, was published in several papers between 1913 and 1915. In 1916 he returned to the University of Copenhagen as professor of physics and in 1920 was made director of the newly formed Institute of Theoretical Physics. At the institute Bohr developed the Correspondence Principle and made other important contributions to theoretical physics. During this period he was visiting professor at many universities. In 1939, recognizing the significance of the fission experiments of the German scientists Otto Hahn and Fritz Strassman (see ATOMIC ENERGY), he convinced physicists in America of their importance. It was he who developed the theory of fission, and later pointed out that the uranium isotope of at.wt. 235 was responsible for the observed fission phenomena. Bohr was required to remain in Denmark on the German occupation of that country in 1940, but escaped to Sweden in 1943, traveling thence to England and finally to the United States, where he lent invaluable aid in the development of the atomic bomb. In 1945 he returned to the University of Copenhagen.

BÖHTLINGK, OTTO VON (1815–1904), German Orientalist, born in St. Petersburg (now Leningrad), Russia. From 1835 to 1842 he studied Oriental languages, especially Sanskrit, at the universities of Berlin and Bonn. Among his works are the first European edition of the works of the Indian grammarian Panini (1839), a collection of passages from Sanskrit literature (1845), and a Sanskrit dictionary (7 vols., 1855–75).

BOIARDO, MATTEO MARIA, CONTE DI SCANDIANO (1434–94), Italian Renaissance poet, born near Reggio Emilia, and educated at the University of Ferrara. He was appointed governor of Reggio Emilia in 1478 by his patron Duke Ercole d'Este, and was reappointed to that post in 1488. Boiardo wrote idyllic and lyric poetry but is best known as the author of one of the greatest narrative poems of Italian literature, *Orlando Innamorato*, which was uncompleted at the time of his death.

BOIDAE, family of snakes including boas and pythons. See BOA.

BOIELDIEU, FRANÇOIS ADRIEN (1775–1834), French composer of comic operas, born in Rouen. He received little formal musical education, but by the time he was twenty years old two of his operas had been successfully produced in Rouen. After 1795 he took up residence in Paris, and in 1803 he became chapel master to the Russian court at St. Petersburg (now Leningrad). Failing health forced him to return to France in 1812, and in 1817 he was appointed professor of composition at the Paris Conservatory. His works are among the finest examples of comic opera in its early stage of development; they include *La Fille Coupable* (1793); *Rosalie et Myrza* (1795); *Les Deux Lettres* (1796); *La Famille Suisse* (1797); *Le Calife de Bagdad* (1800); *Jean de Paris* (1812); *Le Chaperon Rouge* (1818); *La Dame Blanche* (1825), generally conceded to be his masterpiece; and *Les Deux Nuits* (1829).

BOILEAU-DESPRÉAUX, NICOLAS (1636–1711), French critic and poet, born in Paris, and educated at the Collège de Beauvais and at the Sorbonne. From the age of twenty-one he devoted almost his entire life to literary creation. About 1670 he was granted an annual pension of 200 francs by King Louis XIV, who made Boileau his historiographer in 1677. In 1684 Boileau was elected a member of the French Academy. In his later years he engaged in satiric attacks on the Jesuits, who retaliated by inducing the king to withdraw his favor from Boileau.

Boileau's influence both as poet and critic was great. He established the principles of French classical literature, and was called the "Lawgiver of Parnassus". His works include twelve *Satires* (begun in 1660) in rhymed couplets, which contain wittily barbed criticism of contemporary writers; *Dialogue des Héros de Roman* (1664), a work of satirical prose criticism directed against the prevailing artificial, poetical romances of his time; several volumes of *Épîtres* (begun in 1669), satirical poems in the vein of the *Satires*; *L'Art Poetique* (1674), written in imitation of Horace's *Ars Poetica*, in which Boileau analyzed the various kinds of poetry and laid down the principles governing their composition; and *Le Lutrin* (1674), a mock-heroic poem which was later used by the English poet Alexander Pope as a model for his *Rape of the Lock*.

BOILER, in steam engineering, a vessel in which steam is generated for heating or power purposes. In its simplest form, it consists of a closed vessel made of sheet metal, having apertures for the admission of water and egress of steam, with gauges for showing the level of the water and the pressure of the steam, and set or mounted in combination with a furnace, either internal or external, ac-

cording to the type of boiler. The form of a boiler is determined by two considerations: strength to withstand internal pressure, and efficiency in producing steam. The spherical form is best adapted for strength and was the first used; the Greek scientist Hero of Alexandria used it about 150 B.C.

Modern steam boilers may be classified according to their form and construction or according to the character of their employment. Under the first division are horizontal and vertical boilers, internally and externally fired boilers, shell and sectional boilers, fire-tube and water-tube boilers, or boilers combining two or more of these features. Under the second division are included stationary boilers, locomotive boilers, marine boilers, and various forms of portable or semi-portable boilers. Boilers are used to supply "process steam" as an agent or raw material for industrial chemical reactions.

The historical development of boilers followed the development of steam engines. Until about 1700, engines and boilers were not built separately. During the 18th century, because of the development of the steam engine by the British inventors Thomas Newcomen and James Watt, larger and more efficient boilers were built. They were generally made of wrought iron, and designed to withstand what would now be considered very low pressures: about 10 psi (10 pounds per square inch above atmospheric pressure). The Watt "wagon-top boiler", so called from its shape, was a marked improvement because it contained an internal flue through which the hot gases from the furnace passed; it was the first fire-tube boiler. The development during the 19th century of compound engines and engines using high-pressure steam required high-pressure boilers, and cylindrical steel boilers with hemispherical ends were soon developed. Early in the 19th century such boilers produced steam at about 25 psi. Today pressures over 1000 psi are common and pressures up to 3000 psi have been successfully used.

The temperature and pressure at which a boiler operates are connected by a definite relationship (see BOILING POINT), as shown in the accompanying table.

The higher temperatures are desirable because they allow the steam engine to operate at greater efficiency. Extremely high pressures are practical only in large, stationary installations in which the increased expense of construction can be repaid by the decreased cost of power production over a long period of time. Modern practice is to produce steam at moderate pressures and then *superheat* the steam by passing it through a separate compartment, called a superheater, where the hot gases produced by the boiler fires raise the temperature of the steam about 200° F. (111° C.), without materially affecting the temperature and pressure of the water and steam in the main section of the boiler. Superheated steam has the further advantage of being dry; its temperature is so far above the boiling point that it does not deposit droplets of water.

BOILING POINT OF WATER AT VARIOUS PRESSURES

Temperature °F	Temperature °C	Pressure psi
212	100	0
300	149	52
400	204	232
500	260	666
600	316	1529
700	371	3080
705	374	3200

Rating. Boilers are rated by the amount of steam they can produce in a certain period of time at a certain temperature. The largest units produce over 1,000,000 lbs. per hour (this is the actual weight of the steam, not its pressure) at temperatures of over 800° F. (427° C.) Boilers are also rated on a power basis. However, since the amount of power developed depends primarily on the type of engine which uses the steam, these power designations are largely arbitrary. Thus, a boiler is rated at one horsepower for every 34.5 lbs. of water it can evaporate per hour from feed-water temperature of 212°F. into dry steam at the same temperature. Another definition is one horsepower for every 10 sq.ft. of heating surface in a water-tube boiler or 12 sq.ft. of heating surface in a fire-tube boiler. The rated horsepower of a boiler may thus differ considerably from the actual power developed.

Fuel. Any fuel may be used to heat a boiler. For large, coal-burning installations, mechanical stokers are generally used. Fuel oil is easier and more efficient to use, but generally more expensive. The convenience and efficiency of liquid fuel may be achieved with coal by pulverizing it and spraying the powdered coal into a combustion chamber as if it were a liquid. Boilers using electricity to heat the water are more efficient than coal- or fuel-oil-fired boilers, but the cost of electricity is

prohibitive except in special circumstances. Atomic power plants, now being designed for peacetime use, use the energy of nuclear reactions as the source of heat for a conventional boiler.

Feed water is generally preheated in an economizer which utilizes waste heat from flue gases and brings the water to a temperature slightly below the temperature of the boiler. A feed-water pump must be installed which is capable of forcing the water into the boiler against the pressure of the steam. If the feed water is hard, boiler scale forms. This condition is undesirable because the scale lowers the efficiency of the boiler by acting as a heat insulator, because thick layers of scale cut down the circulation of water within the boiler, and because scale causes strains which may lead to a failure or even an explosion of the boiler. In many cases condensed steam from the steam engine is returned as soft feed water for the boiler to avoid the expense of a water-softening system.

Air in enormous quantities—almost 200 cu. ft. for every pound of fuel—is required for combustion. In many boiler installations, *preheating* of this air by escaping flue gases before it reaches the fuel reduces slightly the heat waste. The air is forced through the preheaters and through the furnace by enormous fans which, in the largest installations, may require thousands of horsepower to operate. This power requirement is generally not so high for water-tube boilers as for fire-tube boilers in which the fans must also supply the power to force the gases through the fire tubes.

Safety. If a boiler breaks while in operation, the escaping high-pressure steam expands rapidly; the water, which is far above its normal boiling point, boils violently, and almost instantaneously gives rise to an additional large volume of steam. The result is generally a violent explosion. Boilers are therefore always constructed with considerable margins of safety; that is, they are built to withstand temperatures and pressures much higher than those present under normal operating conditions. Numerous safety devices are also used to guard against low water, which would cause overheating, and against excessive pressure. The simplest such device is the safety valve, which permits steam to escape without danger if the pressure becomes excessive. In the U.S. rigid State and municipal codes control the construction, maintenance, operation, inspection, testing, and insuring of boilers.

Clinton Boilers. The boilers erected at the Clinton Engineer Works in Tennessee in 1943–44 for the atomic-bomb project are an outstanding example of a large, modern steam plant. Three boilers generate a total of 2,250,000 lbs. per hour of superheated steam at 1325 psi and 935° F. (502° C.). Most of this steam is used to drive 14 turbogenerators developing 238,000 kilowatts of electricity; the remainder is used for heating in the gaseous-diffusion and thermal-diffusion plants (see ISOTOPES). Larger steam plants exist, but this was the largest initial steam installation ever made.

Boilers cannot properly be studied independently of the engines which use the steam they produce. See STEAM AND STEAM ENGINEERING.

BOILING, or EBULLITION, rapid evolution of vapor from a liquid by means of bubbles formed beneath the surface of the liquid; as these bubbles rise within the liquid they become larger by the addition of further vapor, and escape from the surface with more or less violence.

The evolution of vapor from the surface of a liquid is called *evaporation.* The corresponding evolution of vapor from a solid is called *sublimation.* Every liquid or solid has a definite tendency to give off vapor, and this tendency can be measured and expressed as "vapor pressure". Increase of temperature increases the vapor pressure and therefore increases the rate of evaporation. Boiling begins, however, only when the vapor pressure of a liquid is greater than atmospheric pressure, so that bubbles formed within the liquid can increase in size. See BOILING POINT; EVAPORATION; VAPOR.

BOILING POINT, temperature at which a liquid boils (see BOILING). Boiling point depends only on the chemical constitution of the liquid and on the atmospheric pressure. At normal atmospheric pressure, water boils at 212°F. (100°C.). This temperature varies about 1° with atmospheric fluctuations due to weather. At higher pressures the boiling point increases (see BOILER), reaching a maximum of 705°F. (374°C.) at a pressure of 3200 lbs. per sq.in. Above this temperature water cannot exist as a liquid. At pressures below normal atmospheric, the boiling point of water is lowered, reaching a minimum of 32.013°F. (0.007°C.) at a pressure of about 1/10 lb. per sq.in. Below this temperature the boiling point is replaced by the subliming point.

At altitudes appreciably above sea level, the pressure is lower and the boiling point is cor-

respondingly lower. At Denver, Colo., where the altitude is exactly one mile, the boiling point of water is about 201°F. (94°C.); at the top of Mt. Everest, 29,000 ft., water would boil at only 160°F. (71°C.). Such tempertures are not hot enough to cook food, and if food is to be boiled at high altitude, it is necessary to use an *autoclave* or pressure cooker, which raises the boiling point of water and thus allows food to cook more rapidly.

The substance with the lowest boiling point is helium: —452.0°F. (—268.9°C.), only about 8°F. above absolute zero. The substance with the highest boiling point is probably tungsten: about 10,620°F. (5900°C.). The boiling points of various elements and compounds are given in the separate articles on each of these substances. If not otherwise stated, the boiling point is in each case understood to be that at normal atmospheric pressure.

BOIS DE BOULOGNE, well-known park of Paris, France, established during the reign of Napoleon I and covering about 2155 acres. Its site was occupied originally by the Forêt de Rouvray, a large forest near the western boundary of the city. In 1870–71, during the Franco-German War, the park was badly damaged by bombardments, but was subsequently restored. Among outstanding features of the Bois are the famous Auteuil and Longchamps race courses and the Jardin d'Acclimation.

BOISE, capital and largest city of Idaho, and county seat of Ada Co., 2739 ft. above sea level, on the Boise R., about 45 miles E. of the Oregon boundary. It is the trading center of a region with diversified industries, including farming, dairying, grazing, lumbering, and mining. Industries in the city include the packing of meat and fruit, brewing, and the manufacture of castings, farm machinery, flour, feed, lumber, building blocks, furniture, rugs, and mattresses. About 22 miles to the E., across the Boise R., is Arrowrock Dam, which provides electric power for the city's manufacturing industries. The first settlement on the site of Boise was Fort Boise, a U.S. Army post established in 1863, during the Civil War. In 1864 the post was organized as a city and became the capital of the Idaho Territory. Boise became the State capital in 1890. The city is noted for its gardens and tree-lined avenues. The Idaho State Capitol, classical in design, is its most impressive public building. Located in Boise is the Boise Junior College, a coeducational school founded in 1932. Pop. (1950) 34,393.

BOISGUILLEBERT, PIERRE LE PESANT, SIEUR DE (1646–1714), French economist, born in Rouen, and educated in the schools in Rouen. After serving as a judge in Montivilliers, he became in 1690 a civil official in his native city. Boisguillebert was the first economist of note to criticise the prevailing economic policy of *mercantilism*, and anticipated many of the theories of the 18th-century physiocrat economists; see ECONOMICS: *History*. In *La Détail de la France* (1695), *Factum de la France* (1705–06), and other works, he expounded the views that the real wealth of a country is determined by the production and exchange of goods, and not by the amount of money that it possesses; and that the economic difficulties confronting France in his time might be overcome by stimulating the consumption and production of commodities. He proposed a uniform tax on all revenue from property and the abolition of imposts and internal duties borne chiefly by the agricultural and middle classes.

BOIS-LE-DUC. See HERTOGENBOSCH, 's.

BOJER, JOHAN (1872–), Norwegian novelist and playwright, born in Orkedalsoren, and educated at the Military School of Trondheim. After a brief business career he turned to writing. His first drama, *A Mother*, won him a scholarship which enabled him to continue his education in Germany, France, Italy, and England. Though he wrote several plays, including *Moder Lea* (1900), *Troens Magi* (1903), *Theodora* (1903), and *Brutus* (1904), his international reputation is based on his novels, the first of which was *Helga* (1905). His works are characterized by originality, realism, attention to contemporary problems, and a vigorous style. Among his novels which have been translated into English are *The Great Hunger* (1919) and its sequel *The New Temple* (1928), *The Everlasting Struggle* (1931), *The House and the Sea* (1934), *By Day and Night* (1937), and *The King's Men* (1940).

BOK, EDWARD WILLIAM (1863–1930), American editor, author, and philanthropist, born in Helder, the Netherlands. He was brought to the United States at the age of six, and later worked for various publishing firms in New York City. In 1886 he formed the Bok Syndicate Press, which published the sermons of the American clergyman Henry Ward Beecher. From 1889 to 1919 he was editor of the magazine *Ladies' Home Journal* in Philadelphia, Pa. In 1923 Bok established the American Peace Award, a prize of $100,000

for the most practicable plan for securing permanent world peace. The prize was won in 1924 by the American educator Charles Herbert Levermore. Bok also established in 1923 the Harvard Advertising Awards for the best examples of layout, typography, and general excellence in American advertising. He gave generous gifts to the Philadelphia Orchestra and in 1928 he endowed and gave to the United States the Mountain Lake Bird Sanctuary and Singing Tower, near Lake Wales in Florida. His writings include *The Americanization of Edward Bok* (Pulitzer Prize, 1920), *Dollars Only* (1926), and *Perhaps I Am* (1928).

BOKER, George Henry (1823–90), American diplomat and writer, born in Philadelphia, Pa., and educated at Princeton University. Boker served as United States minister to Turkey (1871–75) and to Russia (1875–79). His writings include *The Lesson of Life and Other Problems* (1847), a volume of poems; the tragedy *Calaynos* (1848); *Francesca da Rimini* (1855), his best-known play; *Plays and Poems* (2 vols., 1856); and patriotic lyrics composed during the Civil War.

BOKHARA. See Turkmen Soviet Socialist Republic; Uzbek Soviet Socialist Republic.

BOKOM. See Sapanwood.

BOKSBURG, town of Transvaal Province, Union of South Africa, 15 miles E. of Johannesburg. The town lies on the Witwatersrand, a ridge famous for its gold-bearing veins. It is a gold- and coal-mining center. Pop. (1951 prelim.) 64,213.

BOL, Ferdinand (1616–80), Dutch painter, born in Dordrecht, and trained under the Dutch painter Rembrandt van Rijn. His earliest works have been attributed to Rembrandt. Some of his pictures are at the Hermitage, Leningrad. Others are in Amsterdam; the National Gallery, London; and the Louvre, Paris. One of his masterpieces is "The Regents of the Leper Hospital" (Town Hall, Amsterdam, 1649).

BOLAN PASS, narrow, precipitous gorge in Pakistan, leading northward from the town of Sibi, Baluchistan, to the town of Quetta, Baluchistan. It serves as an important pass to and from the Baluchistan frontier. The length of the pass is about 60 m.; its maximum elevation is about 5900 ft. above sea level. A railroad connecting Shikarpur, Sind, with Kandahar, Afghanistan, runs partly through the pass.

BOLDINI, Giovanni (1845–1931), Italian genre and portrait painter, born in Ferrara, and educated at the Academy of Florence. He attained success as a portrait painter in London, but in 1872 moved to Paris. His work is characterized by a brilliant and modern technique. It is represented in the Luxembourg Gallery by the "Portrait of a Lady" and "Au Luxembourg", and in the National Gallery, Berlin, by a portrait of the German artist Adolph Menzel. The Metropolitan Museum of Art, New York City, possesses two of his works, "Ladies of the First Empire" and "Des Parisiennes", and the Brooklyn Institute Museum his portrait of the American artist James Abbott McNeill Whistler.

BOLERO, animated Spanish dance, in ¾ time, expressing the emotional gradations of love. In the dance, the body makes abrupt turns and revolutions and the feet are stamped in syncopated rhythm. The dance is usually accompanied by the performers on castanets, and sometimes also by singing. The term "bolero" is applied also to the music suitable for such a dance. Examples of the bolero in classical music are that in *Massaniello*, an opera by the French composer Daniel Auber; *Bolero for Piano, Op. 19* by the Polish composer Frédéric Chopin; and *Bolero*, an orchestral composition by the French composer Maurice Ravel.

The term "bolero" is applied also to a short, sleeveless woman's coat similar to Spanish peasant coats.

BOLESLAV, name of five kings of Poland, of the Piast dynasty. **1.** Boleslav I, known as the Mighty (d. 1025), ruler of Poland from 992 as prince and then as king. At the time of his accession as prince, Poland was a small principality on the Vistula River. Boleslav conquered eastern Pomerania, Silesia, and Moravia, and in 1003 forced Bohemia to acknowledge him as its duke. He fought the Holy Roman emperors Otto III and Henry II for possession of Lusatia, on the Polish border, and by the Peace of Bautzen received it as a fief. At Boleslav's death Poland was one of the strongest states in Europe. **2.** Boleslav II, known as the Bold (1039?–83), grandson of Boleslav I. He succeeded his father, Casimir I, as king in 1058. He conquered the Russian principality of Kiev in 1069 and appointed one of his relatives its ruler. Boleslav II constantly fought the power of the Polish nobility. For a time he was on good terms with the papacy, aiding the pope against the Holy Roman emperors in order to reduce German power, but subsequently he

incurred the antagonism of Pope Gregory VII, was excommunicated and deposed (1079) by him, and went into exile in Hungary. **3.** BOLESLAV III, known as WRY-MOUTHED (1086–1138), King from 1102 to 1138. He extended the boundaries of the kingdom in wars with Pomerania and the Holy Roman Empire, defeating the emperors Henry V and Lothair II. **4.** BOLESLAV IV (1127–73), King from 1146 to 1173. During his reign the Germans and their allies conquered the part of Poland along the Baltic Sea, west of the Vistula River. The Holy Roman emperor Frederick I forced his submission in 1157. **5.** BOLESLAV V, known as THE CHASTE (1221–79), King from 1227 to 1279. In his reign the states bordering Poland constantly warred against the kingdom, and in 1241 the Mongols invaded and devastated the country.

BOLETUS, genus of mushrooms, characterized by a spore surface in the form of pores, rather than gills. It includes over one hundred American and European species. Most of the species resemble the common mushroom and other species of *Agaricus* in general form. A few are poisonous, but many are edible, especially *B. edulis*, which is much used in Europe.

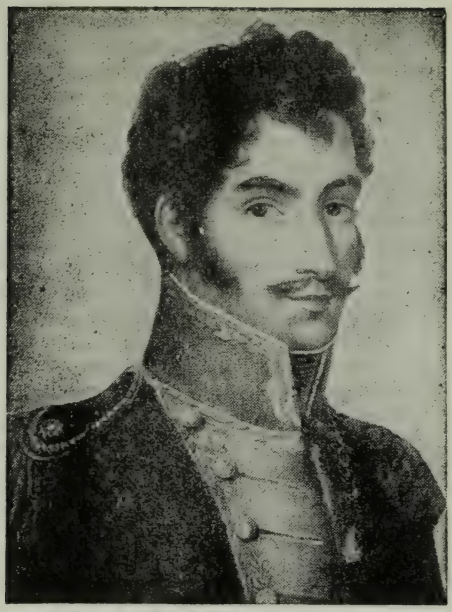
BOLEYN, ANNE (1507–36), second wife of King Henry VIII of England. She was the daughter of Sir Thomas Boleyn, afterward Viscount Rochford and Earl of Wiltshire, and Elizabeth Howard, daughter of the Duke of Norfolk. Anne spent the years 1519 to 1521 at the French court, and after her return to England was courted by the heir to the earldom of Northumberland and by the king himself. Henry married Anne secretly in January, 1533, even before Thomas Cranmer, Archbishop of Canterbury, pronounced (May, 1533) Henry's divorce from Catherine of Aragon. Anne was crowned in June, and in September gave birth to a daughter, who later became Queen Elizabeth.

On May 2, 1536, Anne was imprisoned in the Tower of London on charges of adultery with her brother, three gentlemen of the privy chamber, and a musician of the court, and of conspiring with these men against the king's life. The four commoners were tried on May 12, and Anne and her brother on May 15; all were convicted of high treason. Under torture the musician confessed to the charge of adultery; the others steadfastly asserted their innocence. Anne's father and her uncle, the Duke of Norfolk, were instrumental in her death, the latter presiding over the twenty-six peers who were her judges, and pronouncing her doom. No record of the evidence remains. On the 17th the musician was hanged, and the other four beheaded. Two days later Anne was also beheaded. King Henry the next day was betrothed to Jane Seymour.

BOLINGBROKE, HENRY ST. JOHN, VISCOUNT (1678–1751), English statesman and orator, born in Battersea, and educated at Eton College. He became a member of Parliament in 1701, joining the Tories, and gained immediate distinction by his eloquence. From 1704 to 1708 he was secretary for war under the prime minister Sidney Godolphin; in 1710 he became foreign secretary, and shared the leadership of the party with the chancellor of the exchequer Robert Harley. He was called to the House of Lords in 1712, and in 1713 he negotiated the Peace of Utrecht. After plotting successfully for Harley's downfall, he began in July, 1714, to intrigue for a ministry favoring a Jacobite (q.v.) succession, but his plans were forestalled by the sudden death of Queen Anne. George I came to the throne, and Bolingbroke fled to France. He was impeached by Parliament in 1715. While in France he acted as secretary of state to James Francis Edward Stuart, Pretender to the English throne, and wrote *Reflections on Exile*. King George was persuaded to allow his return to England in 1722, and to restore his property in 1725.

On his return he settled at Dawley, near Uxbridge, and became the associate of Alexander Pope, Jonathan Swift, and other men of letters. He attacked the prime minister Robert Walpole in a series of letters which appeared in his periodical the *Craftsman*, and were reprinted as *A Dissertation on Parties*. Disappointed in his hopes of readmission to political life, he returned to France, where he remained from 1735 to 1742. During these years he wrote *A Letter on the True Use of Retirement* and *Letters on the Study of History*. Bolingbroke's last years were spent at Battersea, where he wrote *Letters on the Spirit of Patriotism* and *Idea of a Patriot King*.

BOLINTINEANU, DIMITRIE (1819–72), Romanian poet and journalist, born in Bolintina, Walachia. In 1849, during an unsuccessful uprising against the Russian protectorate, he wrote articles in support of the revolutionaries in his journal *Poporul Suveran*, and was proscribed and fled the country. After his return he was appointed minister of public instruction in 1859. He was the outstanding Romanian poet of his times. Best known for his poems "The Dying Virgin" and "Flowers of the Bosphorus", he also wrote *Rumanian*



Simon Bolivar

Melodies (1858) and other verse, and dramas, satires, and works of fiction.

BOLITHO, WILLIAM, full name WILLIAM BOLITHO RYALL (1891–1930), British journalist and author, born in Cape Town, South Africa. He served with the British army in France during World War I and at the end of the war joined the staff of the newspaper *Manchester Guardian*. In 1923 he became special European correspondent for the newspaper New York *World*. His works include *Italy under Mussolini, Leviathan, Cancer of Empire, Murder for Profit, Twelve against the Gods* (his best-known book), and *Camera Obscura*, published posthumously. His play *Overture* was produced in New York City in December, 1930.

BOLÍVAR, department of Colombia, bounded by the Magdalena R. on the E., the department of Antioquia on the S., the department of Cauca on the W., and the Caribbean Sea on the W. and N. The surface is low and heavily forested, and the climate is hot and unhealthful. The chief river is the Magdalena, the main traffic route between the Caribbean Sea and the interior; other rivers are the Cauca, a tributary of the Magdalena, and the Sinú. The leading occupations are cattle raising and the growing of tobacco, sugar cane, and fruits; gold is mined and tagua (vegetable ivory) nuts are collected in the forests. Cartagena, capital of the department, is one of Colombia's principal ports. Area, 22,996 sq.m.; pop. (1952 est.) 1,103,560.

BOLÍVAR, province of Ecuador, situated in the western part of the country. The chief occupations are cattle raising, farming, and the collecting of cinchona bark in the forests. Guaranda (pop. in 1950, 7287) is the capital. Area, about 1159 sq.m.; pop. (1950) 109,305.

BOLÍVAR, State of Venezuela, situated S. of the Orinoco R., in the S.E. part of the country. Numerous rivers and vast tracts of tropical grasslands (called *llanos*) characterize the topography of the State. Extensive forests occur in various areas. The grasslands and forested regions are very sparsely inhabited. Gold mining is an important industry in the State. Other industries include cattle raising, lumbering, and the collecting of forest products, notably balata, chicle, and tonka beans. The State capital is Ciudad Bolívar (q.v.). Area, 91,868 sq.m.; pop. (1950) 127,436.

BOLIVAR, SIMON, or (Sp.) SIMÓN BOLÍVAR, known as EL LIBERTADOR (Sp., "the Liberator") (1783–1830), South American revolutionary leader, soldier, and statesman, born in Caracas, Venezuela (then a colony of Spain). After studying law in Madrid, Spain, he traveled in several European countries, including France. There he witnessed the final phases of the French Revolution, an event that profoundly influenced his political philosophy. In 1809 he visited the United States, and during his stay in that country became an enthusiastic admirer of the republican form of government. Following his return to Caracas, he took a leading part in the revolutionary movement which led, on July 5, 1811, to the Venezuelan Declaration of Independence, and he participated in the fighting against the Spanish royalists. After the royalist victory, later in 1811, Bolivar took refuge in Curaçao. He made his way in 1812 to New Granada (now Panama and Columbia), where revolution against Spanish rule was then developing. He organized an army of volunteers in New Granada and, in May, 1813, began a campaign against the royalist forces in Venezuela. His army inflicted a series of disastrous defeats on the enemy, taking Caracas on August 4, 1813, and winning several other notable victories. On June 15, 1814, however, it suffered a severe defeat at Puerto Cabello, leading to the loss of Caracas. Shortly afterward, Bolivar was forced to leave Venezuela.

Proceeding to Tunja, then capital of the

insurgent government of New Granada, he was assigned to a command in the revolutionary army. He directed the liberation of Santa Fé de Bogotá (now Bogotá) but, after a defeat by the Spanish at Santa Marta, he resigned his post and went into exile, first in Jamaica and later in Haiti. In Haiti he succeeded in organizing a small force of refugee insurgents, with which he invaded Venezuela on January 1, 1817. Shortly thereafter Bolivar defeated a Spanish army at the Venezuelan city of Barcelona. The insurgents established a revolutionary government at Angostura (now Ciudad Bolívar), with Bolivar at its head. He won a number of military successes during the next year, but was defeated at Puerto Cabello in March, 1818.

In the course of the next year Bolivar regrouped part of his scattered forces, secured the services of a foreign legion composed of British and Irish soldiers of fortune, and, in May, 1819, started across the Andes mountains to the support of the revolutionists in New Granada, where the royalists had reestablished control. In August, 1819, his army routed the Spanish at Boyacá (see BOYACÁ, BATTLE OF), ending effective royalist rule in New Granada. Several months later (December 17, 1819) the Republic of Colombia, consisting of Venezuela and New Granada, was proclaimed, with Bolivar as president. He countered a resurgence of royalist activity by leading his army, on June 24, 1821, to an overwhelming victory near Carobobo, insuring Venezuelan independence

His subsequent military career was distinguished by two additional victories over the Spanish. As a result of the first of these, at Bombona in April, 1822, he secured independence for Quito (now Ecuador), which then became part of the Republic of Colombia. In the next, he led the military forces of Peru, which had enlisted his services in its fight for independence, in a battle that marked the turning point in the Peruvian struggle against Spanish rule. In February, 1825, he was elected president of Peru, and in the following May he organized, in S. Peru, a new republic, which was named Bolivia in his honor. From September, 1826, when he left Peru, to 1830, Bolivar sought unsuccessfully to maintain the political unity of the Republic of Colombia, in the constituent States of which separatist movements were gaining headway. He resigned the presidency of the Republic of Colombia in August, 1828, but assumed dictatorial control in the following month. The separatist movements continued, however, notably in Venezuela. Unable to pacify the contending factions, he relinquished power on April 27, 1830.

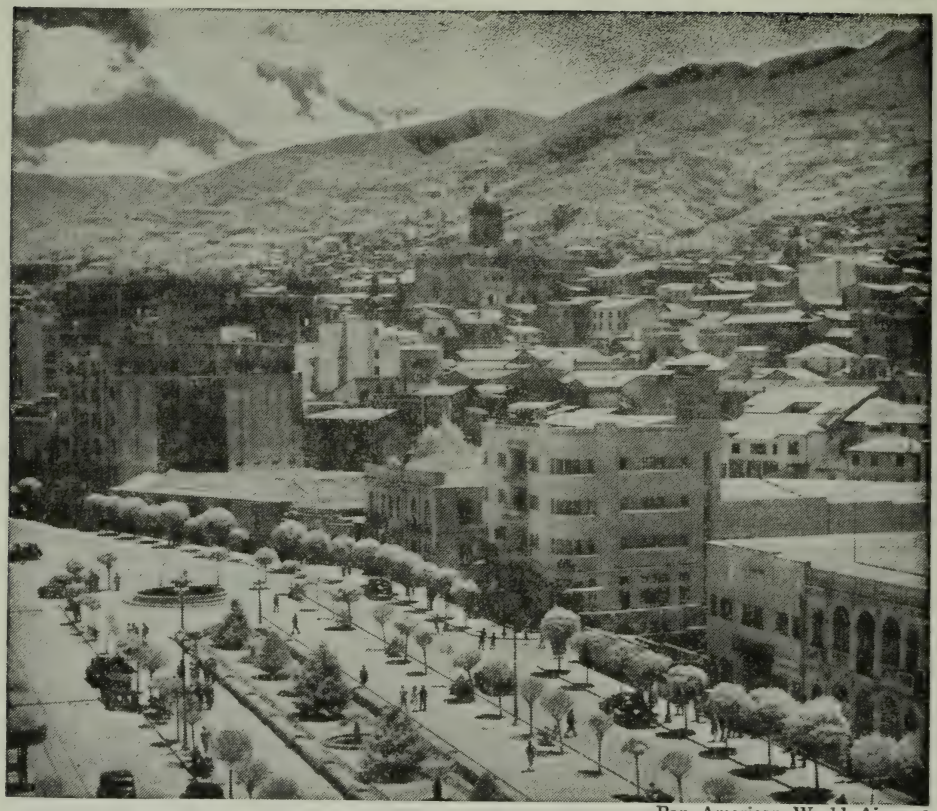
Bolivar's memory is revered throughout South America, and in several countries, including Venezuela and Bolivia, his birthday (July 24) is a national holiday.

BOLIVIA, republic of the South American continent, bounded on the N. and E. by Brazil, on the S.E. by Paraguay, on the S. by Argentina, and on the W. by Chile and Peru. It lies in the W. central interior of the continent and is the only South American country without direct access to the sea. In a N. and S. direction the maximum length of Bolivia is approximately 900 m.; its extreme breadth, in an E. and W. direction, is about 800 m. The area of the country is 404,388 sq.m., making it fifth in size (after Brazil, Argentina, Peru, and Colombia) of South American countries.

The constitutional capital of Bolivia is Sucre (q.v.); La Paz (see PAZ, LA), the largest city, is the administrative capital. Other important cities and towns are Cochabamba, Oruro, Potosí, Santa Cruz, and Tarija. For administrative purposes the republic is divided into nine major political divisions, called departments. The departments are, in descending order of size (area), Santa Cruz, El Beni, Tarija, Potosi, La Paz, Chuquisaca, Pando, Cochabamba, and Oruro. The population of Bolivia (1956 est.) is about 3,235,000.

Physical Features. In the W. part of the country, extending generally N. and S., is the main range of the Andes, the Cordillera Real. The Cordillera Real is surmounted by some of the highest Andean peaks, notably Ancohuma (21,490 ft.) and Illampu (21,276 ft.), the twin peaks of Mount Sorata; Sajama (21,390 ft.); and Huaina Potosí (20,260 ft.). Between the crest of the Cordillera Real and the Cordillera Occidental, which generally demarcates the frontier between Bolivia and Chile, lies the Bolivian Plateau (12,000 to 13,000 ft.), one of the highest inhabited regions in the world. The *altiplano*, as the plateau region is called, is about 500 m. long and 80 m. wide. The northern part, where the bulk of Bolivia's population and industry is found, contains many well-watered valleys and, at its end, Lake Titicaca. This lake, about 125 m. long and 70 m. across at its widest point, is the highest large, navigable lake in the world. It encloses the islands of the Sun and the Moon, which are famous in Inca legends. The southern part of the plateau is chiefly desert.

Stretching E. and N.E. from the mountains



Pan American World Airways

The city of La Paz, in the Bolivian Andes Mountains

are the great Amazonian plains, containing large grassy tracts and, along the rivers, dense tropical forests. Much of this region becomes swampland during the wet season (December, January, and February); large areas, however, lie above the flood line, and are rich grazing lands. In the S.E., separated from the Amazonian plains by the Chiquitos highlands (about 3500 ft.) in Santa Cruz Department, are the dry, semitropical plains of the Gran Chaco (see CHACO, EL).

In the northern and northeastern valleys and plains, the drainage system consists of the Beni R. and its main affluent, the Madre de Dios R., the Guaporé R., which forms part of the boundary with Brazil; and the Mamoré R. The Mamoré and its tributaries unite at the Bolivian-Brazilian border with the Guaporé to form the Madeira R., a chief tributary of the Amazon. The Pilcomayo, the chief river of southeastern Bolivia, belongs to the La Plata River system; it flows through the Gran Chaco to feed the Paraguay, thus eventually draining into the Río de la Plata. In W. central Bolivia, several small rivers discharge into lakes Titicaca and Poopó (Pampa Aullagas). The Desaguadero R., outlet for Lake Titicaca, feeds Lake Poopó, about 165 m. to the southeast.

Climate. Although situated entirely within the tropics, Bolivia, as a result of its varied elevation, possesses a wide range of climate. In the higher regions the climate is cold and dry, but generally healthful, in spite of the cutting winds, the extreme rarity of the atmosphere, and the occasional days of great heat, followed by bitterly cold nights. Vegetation is scanty, and corn, rice, potatoes, barley, and coarse grasses which maintain the animals of this zone, are the only important food crops. In the lower regions the climate is warmer, and tropical crops, including coffee and cacao, are raised.

Principal Products and Industries. Mining is the principal industry of the country. The mineral resources include tin, lead, silver,

copper, antimony, zinc, sulfur, bismuth, gold, tungsten, copper, petroleum, and salt. Bolivia is one of the world's largest producers of tin. Most of the tin is mined, in the plateau region of Potosí and Oruro, under the control of American interests. The silver mines of Potosí, which have been worked since 1545, are estimated to have produced metal, up to the present, worth several billion dollars. The copper mines in the Bolivian Andes are also rich. According to reliable estimates, the petroleum fields in Bolivia are among the largest in South America.

Agriculture ranks next to mining among Bolivian industries. Approximately two thirds of the population are dependent on agriculture for their livelihood. Except for cattle raising and the growing of certain industrial crops, however, the industry is poorly developed, and many basic foodstuffs must be imported. The chief industrial crops are rubber, cinchona bark, and coca. Bolivian manufacturing industries are mainly small-scale enterprises.

Communications. Due to the landlocked position of the republic, the bulk of its foreign trade must be routed through Chile, Peru, and Argentina. The total railroad mileage in 1951 was about 1267. The principal line is the Antofagasta and Bolivian, which connects La Paz with the free port of Antofagasta, Chile. The Arica-La Paz line connects La Paz with the free port of Arica, Chile. La Paz is also connected with the free port of Mollendo, Peru, by lake steamer (Titicaca) and rail (Southern Railway of Peru). The Atocha-Villazon railroad connects Bolivia with the Argentine system. A railroad, constructed jointly with Brazil, connects Santa Cruz de la Sierra in Bolivia with Corumba, Brazil; it was completed in 1953. Four new lines are under construction.

In 1950 about 6280 miles of roads linked the more important towns, but many are passable only in the dry season. About 1000 miles of roads were under construction in 1954. National air lines cover more than 3000 miles and Pan-American Airway lines link Bolivia with the United States. About 12,000 miles of rivers are open to navigation by light-draft vessels. Bolivia was served by 200 post offices, 10,950 miles of telegraph line, and 874 telegraph, telephone, and wireless offices in 1948.

Commerce. In 1952 Bolivia's imports were valued at $64,300,000; sugar, wheat, coal, petroleum, mining machinery, iron and steel products, motor vehicles, and textiles are the chief items. The value of exports was $143,000,000, minerals forming over 90 percent (tin, mainstay of Bolivian economy, accounts for 59 percent). Rubber, vanilla, cinchona bark (for quinine), coco leaves (for cocaine), dried fruits, coffee, cacao, nuts, cattle and cattle products, alpaca and llama wool, and vicuña skins make up the remainder of the exports. The chief sources of imports were the U.S., Peru, the United Kingdom, and Chile. The U.S. and the United Kingdom take the bulk of the exports.

People and Language. About half of the population are Indians. Descendants of the peoples once ruled by the Incas, they speak only their own dialects, Quechua and Aymará. They furnish the bulk of the unskilled labor in the mines and the forest lands, and also fill the ranks in the army. Many, however, are farmers.

About one fourth of the population are *mestizos*, of mixed blood, who run the small shops in the towns and fill minor government positions. The remaining fourth of the population consists mainly of Whites, most of whom are of Spanish descent; they control Bolivia's governmental affairs and are the large landowners. The language of Bolivia is Spanish.

Education and Religion. Primary education is nominally free and compulsory for children between the ages of seven and fourteen, but the public schools, though increasing in number, are inadequate to meet the needs of the country, which has the highest illiteracy rate in South America. There are five universities: at Sucre, La Paz, Cochabamba, Oruro, and Potosí; St. Xavier University at Sucre was founded in 1624, and is one of the oldest in America. Roman Catholicism is the state religion, but other forms of worship are permitted.

Government. Bolivia is governed according to the provisions of the constitution of 1938, as amended in 1944–45. By the terms of this document executive power is vested in a president, elected by direct popular vote for a six-year term; he cannot succeed himself. The president is assisted by a cabinet of nine ministers. Legislative power is vested in a Senate and a Chamber of Deputies, which meet annually. The Chamber of Deputies consists of 110 members elected for four-year terms; the terms of one-half the members expire every two years. The Senate consists of 27 members elected for six-year terms; one-third of the membership is elected every two years. Judicial power is vested in the Supreme Court, in subordinate district courts, and in local courts. The nine justices of the Supreme Court are chosen by Congress

for ten-year terms. All male and female citizens are entitled to vote, at the age of twenty-one if married, at the age of eighteen, if single.

Boundary Disputes. By treaties made in 1866 and 1874 regarding the disputed Atacama Desert, famed for its rich nitrate fields, the 24th parallel of south latitude was adopted as the Chile-Bolivia boundary line in that region. In addition, various customs and mining concessions in Bolivian Atacama were granted to Chile. Disputes arose between the two countries over the latter provisions, and in 1879 Chile seized the Bolivian port of Antofagasta. In the resulting struggle, called the War of the Pacific, Bolivia and its ally Peru were defeated by Chile. By the terms of the peace agreement, signed on November 29, 1884, Bolivia was stripped of its one seacoast possession, becoming a landlocked country. A treaty ratified in December, 1904, recognized the perpetual dominion of Chile over the disputed territory, but granted Bolivia free access to the sea. A dispute with Brazil concerning the possession of the Acre region was settled in 1903, by the cession of about 70,000 sq.m. to Brazil in return for a money indemnity and small territorial compensations elsewhere.

The Bolivian government subsequently became involved in boundary disputes with Argentina, Peru, and Paraguay. A peaceful solution of the dispute with Argentina was reached in 1925. Peru and Bolivia settled disputes over the peninsula of Copacabana by appointing a joint commission to arrange the border line in the 1930's.

The Paraguay-Bolivia boundary dispute arose over the Chaco Boreal, a low region lying N. of the Pilcomayo R. and W. of the Paraguay R. and extending to the undisputed boundary of Bolivia. Both Bolivia and Paraguay claimed the entire territory. In July, 1932, an undeclared war broke out. After three years of inconclusive fighting, the two countries finally arranged an armistice in June, 1935, and a peace treaty was drawn up and signed in July, 1938. The much-disputed boundary line was fixed by arbitration in October of the same year, giving Paraguay a major part of the Chaco region. See CHACO, EL.

At the United Nations Conference at San Francisco (Apr. 25–June 26, 1945), Bolivia, handicapped economically because of the necessity of conducting its foreign trade through Chile, Peru, or Argentina, raised demands for a seaport on the Pacific coast. The Bolivian delegate suggested that at a future date the U.N. General Assembly consider the revision of the 1904 treaty with Chile.

History. The territory of Bolivia, a part of the ancient empire of the Incas (q.v.), was conquered in 1538 by the Spanish conquistador Hernando Pizarro, younger brother of Francisco Pizarro, who subdued Peru, heart of the Inca empire. As the audiencia of Charcas, or Upper Peru, Bolivia constituted a subdivision of the vice-royalty of Peru till 1776, when it was annexed to the new vice-royalty of La Plata (Buenos Aires). Within forty years after the conquest of the territory, Spanish settlements were formed at Chuquisaca (Sucre), Potosí, La Paz, and Cochabamba, and numerous silver mines, in which the Indian population was compelled to labor, were opened.

Bolivia declared its independence of Spain on August 6, 1825, and took the name of Bolivia on August 11. A constitution drafted by the South American revolutionary leader Simon Bolivar, eponym of the country, was adopted by a congress at Chuquisaca (Sucre) in 1826. It vested supreme authority in a president chosen for life.

From the beginning of its national existence, Bolivia was plunged into a state of nearly chronic revolution and civil war. The first president, General Antonio Sucre, a close colleague of Bolivar, was expelled from the country after holding office for only two years. During the next half century interludes of political tranquility were brief and infrequent. The constitution of 1880 vested executive power in a president elected for four years, but it failed to improve the political situation, which continued uninterruptedly to be chaotic.

The period after 1930 is typical of the political history of Bolivia. In that year a revolution overthrew President Hernando Siles, who had governed for two years without convening the national legislature. The political leader Daniel Salamanca, elected president in 1931, was overthrown in 1934 by a clique under Vice-President Tejada Sarzano, who in turn was overthrown by a military junta led by Colonel David Toro. As provisional president, Toro was largely successful in his attempts to extricate the country from the desperate conditions resulting from the world depression and the Chaco conflict with Paraguay. By such acts as confiscating the Bolivian properties of the Standard Oil of Company of New Jersey and the profits of the mining companies, however, President Toro made enemies

in influential quarters. In 1937 he was ousted for "negligence" by a group led by Lt. Col. Germán Busch, chief of the general staff.

In 1938, during Busch's second term as president, a new constitution was adopted. President Busch abolished the new constitution in April, 1939, however, and set up a totalitarian state. On Aug. 23 he was found dead of a bullet wound, and it was officially announced that he had committed suicide. General Carlos Quintanilla, who then assumed the presidency "by vote of the generals and officers of the La Paz garrison", re-established the republican government under the 1938 constitution, and stated that the army would exercise control until new elections could be held.

In 1940 General Enrique Peñaranda was elected president, and on April 7, 1943, during World War II, he announced a state of war against the Axis Powers (q.v.). The formal Bolivian declaration of war (Dec. 4), although of little importance from the military viewpoint, was of considerable aid to the war industries of the United States and Great Britain. The mobilization decree made possible the conscription of some 10,000 more men for work in the Bolivian mines, and the production of tin, antimony, tungsten and other scarce, strategic minerals was thereby increased. Opponents of the Peñaranda government subsequently charged that it, in conjunction with American firms, was exploiting Bolivian labor, the labor conscription order having been adopted after a battle at the Catavi tin mines between striking miners and government troops. An investigation of the labor situation by a U.S.-Bolivian commission justified completely the complaints of Bolivian labor, and recommendations were made by the commission in regard to wages, working conditions, and other reforms. The Peñaranda government agreed to carry out the recommendations so far as practicable.

In December, 1943, President Peñaranda was ousted in a military *coup d'état* staged by the National Revolutionary Movement, which, while proclaiming only a policy of nationalism and opposition to foreign capital, was actually sympathetic with the Axis Powers. However, Lt. Col. Gualberto Villarroel, installed as temporary president, deported many of the Germans and Japanese in Bolivia. The U.S., which had not at first recognized his government, thereupon resumed diplomatic relations with Bolivia. Villarroel's formal election soon followed. Although compelled, chiefly by economic pressure, to preserve good relations with the Allied powers, the government of Bolivia under Villarroel continued to maintain totalitarian rule, with suppression of political parties and labor unions, censorship of the news, and other methods of the police state.

President Villarroel remained in office until July 22, 1946, when the revolutionary students and workers of La Paz overthrew the government and hanged him from a lamppost in the public square. A provisional government was then organized, under Supreme Court Justice Nestor Guillen, with the announced policy of restoration of civil liberties, free elections, the lifting of censorship, and the punishment of various officials of the Villarroel government. Labor groups, in particular the tin workers, supported the new government, which announced also the policy of barring members of the army from public office. The liberal statesman Tomás Manje Gutiérrez became acting president on August 16. The presidential election of Jan. 5, 1947, resulted in the victory by a narrow margin of Enrique Hertzog, candidate of the Bolivian Genuine Republican, Socialist-Republican, and Socialist parties, over Luis Fernando Guachalla, candidate of the Liberal Party.

A number of Indian uprisings occurred in various parts of Bolivia during the first year of Hertzog's administration, and by September 18 the domestic political situation was so explosive the government declared a state of siege for the entire republic. The contending political factions maintained an uneasy truce throughout 1948. An attempt by Villarroel's former followers to take power was quelled in February, 1949, but in the next August they staged a second rebellion. In the ensuing civil war they nearly succeeded in overthrowing the government, but were overcome after more than a month of sanguinary fighting. Meanwhile (October, 1949) President Hertzog, for reasons of ill-health, formally resigned and Vice-President Mamerto Urriolagoitia was sworn in as president. Essentially centrist in orientation, the policies of the new government met relentless opposition from both the rightist and leftist political groupings in Bolivia. Two rightist conspiracies to seize power were frustrated during the first three months of 1950, and in February the government announced discovery of a Red plot in La Paz. The Communist Party and "all its activities and subsidiary organizations" were outlawed by governmental decree in April.

Due to sharp decreases in the price of tin on the world market, economic conditions worsened steadily during the ensuing twelve

months. In the presidential election of May 6, 1951, nearly half the electorate voted for Victor Paz Estenssoro, exiled leader of the National Revolutionary Movement. With all six of the candidates lacking a clear majority, election of a president (from among the three leading candidates) devolved on Congress. On May 16 President Urriolagoitia, acting to prevent the election of Paz Estenssoro, placed the government under the control of a military junta and resigned. General Hugo Ballivián former undersecretary of defense, was appointed president.

The National Revolutionary Movement staged (April 9, 1952) a *coup d'etat* which resulted in the overthrow of the Ballivián government after three days of sanguinary rioting. Paz Estenssoro returned from exile on April 15 and assumed the presidency the next day. In his first official statement he promised to nationalize the tin industry and outlined a prolabor, anticommunist, and procapital program. On Oct. 31 he signed a decree expropriating the tin mines.

A formula for compensating former tin-industry stockholders and owners was announced by Bolivia in June, 1953. In October Bolivia, then contending with serious food shortages, obtained economic aid valued at $9,000,000 from the U.S. under the Point Four Program (q.v.). Meanwhile, the government had inaugurated (Aug. 2) a comprehensive program of agrarian reform providing for the distribution of parcels of land from expropriated estates to more than 2,500,000 landless peasants. It attempted also to diversify the economy by the introduction of coffee cultivation in the w. highlands and by the exploitation of petroleum resources.

Despite these moves, the Bolivian economy remained dependent through 1956 on shipments of food and on other economic aid from the United States. In April, 1956, President Paz Estenssoro revealed that the results of the nationalization of the tin mines had been disappointing. The fall of world prices for tin and the unwillingness of the miners to work as hard for the state as they had for the private owners were blamed for the situation.

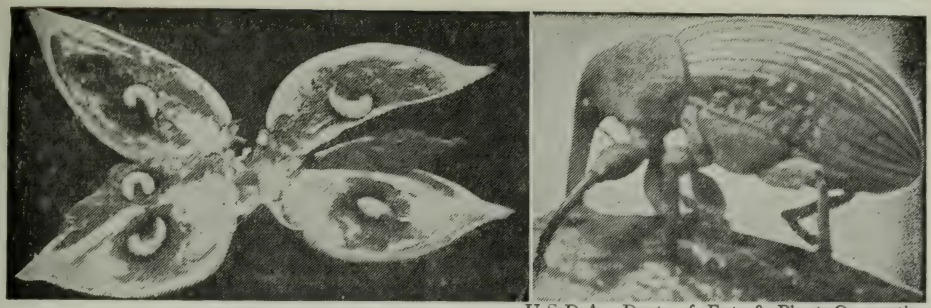
Meanwhile various plots by rightist groups to overthrow the government had been uncovered and the plotters had been imprisoned or exiled. However, in a general amnesty proclaimed in March, 1956, some 300 political prisoners were freed and the exiles were allowed to return.

In national elections held on June 17, Vice-President Hernán Siles Zuazo, candidate of the National Revolutionary Movement, was elected to succeed Paz Estenssoro. Siles received more than four times as many votes as the candidate of the fascist-oriented Bolivian Socialist Phalange. He was inaugurated on August 6.

BOLLAND, Jean de (1596–1665), Flemish ecclesiastic and writer, born in Tirlemont. He joined the religious order of Jesuits in 1612, and about 1630 he was sent by his superiors to Antwerp to compile and edit the *Acta Sanctorum* (Lives of the Saints). The first volume of this work was published about 1643. After Bolland's death, the work was continued by his assistants and successors; see Bollandists.

BOLLANDISTS, an association of Jesuits by whom the *Acta Sanctorum*, or Lives of the Saints of the Christian Church, were collected and published (1643–1794). It received its name from the Flemish Jesuit hagiologist Jean de Bolland (1596–1665), who edited the first five volumes. The huge undertaking had been projected by a Flemish Jesuit, Heribert Rosweyde, and on his death in 1629 his collections were entrusted to Bolland, who undertook the work in Antwerp. The suppression of the Jesuit order in 1773 caused the removal of the Bollandist Society to the monastery of Coudenberg in Brussels, until the persecutions under the Holy Roman emperor Joseph II brought about its dissolution. In 1789 the abbey of Tongerloo in Brabant took up the task of carrying on the *Acta Sanctorum,* but after the publication of the fifty-third volume, in May, 1794, the French Revolutionary forces invaded the country and dissolution of the abbey put an end to the work. In 1837 a new Bollandist association of Jesuits was formed under the patronage of the Belgian government, and in 1845 the fifty-fourth volume appeared. A new edition, in sixty-one volumes, was published in Paris (1863–67); since 1882 supplements, with facsimiles of the more valuable manuscripts, have appeared in Paris and Brussels in a periodical, *Analecta Bollandiana.*

BOLLEY, Henry Luke (1865–), American plant pathologist, born in Manchester, Ind., and educated at Purdue University. In 1890 he became professor of botany and zoology at North Dakota Agricultural College and botanist and plant pathologist of the Agricultural Experiment Station there. His investigations into diseases of plants, including potato scab, flax wilt, and bunt of wheat, and the methods he developed to prevent and remedy them, greatly benefited American



U.S.D.A., Dept. of Ent. & Plant Quarantine

Left: Opened cotton boll, showing boll weevil larvae and damage done by them. Right: The adult boll weevil.

agriculture. His two outstanding contributions were the first use of formaldehyde against grain smuts (1892–93), and the discovery of the parasite which causes potato scab. From 1909 to 1929 he was seed commissioner for the State of North Dakota.

BOLL WEEVIL, common name for *Anthonomus grandis*, a destructive weevil (q.v.) which infests cotton plants. The adult insect is long-snouted, grayish in color, and usually less than ¼ in. in length. It feeds only on the cotton plant; throughout the season it punctures the buds and bolls and lays its eggs in them. The larva, a fat, white maggot, lives upon the internal tissues of the buds and bolls. When a bud is attacked by larvae it usually drops, but most of the damaged bolls remain upon the plant and become stunted or dwarfed.

The life cycle of the boll weevil, from egg to egg-laying adult, is about three weeks. The adults do less damage than the larvae, but continue to live and reproduce for several weeks, so that the various generations (there are four or more in each summer) become mixed, and weevils in all stages of maturity may be found together late in the summer. Adult weevils which emerge in the autumn hibernate in grass, late cornstalks, old bolls on the cotton plants, or piles of seed around the cotton gins. They reappear in the spring about the time the cotton plant blossoms.

The insect was first known in Central America and the West Indies. In 1863 its ravages stopped the cultivation of cotton in the Monclova district of the state of Coahuila in Mexico. In 1888 it spread across the Rio Grande River to Brownsville, Texas. From this focal point in the U.S. it moved outward at a rate of about 70 miles a year. By 1902 it ranged over most of the cotton-growing region of Texas. By 1905 the boll weevil was found in Louisiana and Oklahoma. It reached Mississippi in 1907, Alabama in 1910, Georgia in 1915, and South Carolina and central Florida in 1917. By 1919 it had reached North Carolina and southern Florida. Today it is found in every part of the cotton-growing district of the U.S. east of the Rocky Mountains. See COTTON.

BOLLWORM, one of the common names for the caterpillar of a noctuid moth, *Heliothis obsoleta* or *armigera*. When it is found on cotton it is called bollworm; it has many other popular names, such as tobacco-bud worm, corn-ear worm, and tomato-fruit worm, derived from the names of the plants it infests. The adult is about ¾ in. in length and varies in color from yellowish white to dull green. The larvae also are variable in color; they may be bright green, deep pink, or dark brown, and may be plain, spotted, or striped. In northern U.S. the insect produces two generations a year; in the south it may produce as many as six. The adult deposits its eggs on the plant, and, after hatching, the larva feeds on the plant for about three weeks, and then drops to the ground and burrows into the soil to pupate. The last generation of the summer passes the winter in the pupal stage. In the U.S. the caterpillars cause annual damage to the cotton crop amounting to $20,000,000 and to the corn crop amounting to $50,000,000. The pest may be controlled by spraying or dusting the crop with insecticides.

BOLOGNA, capital of the province of the same name, Emilia, Italy. The city is situated in a fertile plain at the foot of the Apennines, about 50 miles N. by E. of Florence. Industrially Bologna is of great importance. The products for which the city is famous are macaroni, sausages, liquors, and canned fruit. The city also contains beet-sugar refineries, rice-processing plants, and factories producing glass,

Statue of Mercury, by Giovanni da Bologna

textiles, leather goods, machinery, and railroad equipment.

Narrow streets, numerous towers, and old palaces give Bologna a medieval aspect. In both the new and old quarters the façades of most of the houses overhang the sidewalk, being supported on vaulted arcades. The arcades, which extend for miles, form open galleries and are lined with shops. Many of these arcades date from the 13th to the 16th century, the period of the city's greatest prosperity, and are excellent examples of both Gothic and Renaissance civic architecture in brick and terra cotta.

Among the outstanding points of interest in Bologna are the churches, one of which, the former cathedral of Santi Pietro e Paolo, dates from the 4th century. Other noteworthy churches are San Sepolcro, built during the 6th and 7th centuries; San Petronio, the city's largest ecclesiastical edifice, which dates from the late 14th century; and the 14th-century cathedral of San Pietro, a structure in the baroque architectural style. The city is the site of several fine feudal fortifications, including the Asinelli Tower. This structure of brick construction and 320 ft. high, leans 4 ft. out of the perpendicular. It dates from 1109. The Garisenda Tower, which is 163 ft. high and 10 ft. out of the perpendicular, is compared in the celebrated Italian poet Alighieri Dante's *Inferno* (canto 31) to the mythical giant Antæus.

According to legend the city, known originally as Felsima, was founded about the 8th century B.C. by Etruscan colonists. Felsima was conquered, probably in 196 B.C., by a branch of the Boii, a Gallic people. The Boii, close relatives of the tribes that settled Bohemia, renamed the city Bononia; hence the modern designation. In 189 B.C. Bologna was taken by the Romans, and it subsequently became one of the leading cities of the Republic of Rome and of the Roman Empire. The city was annexed to the Byzantine (Eastern Roman) Empire about fifty-seven years after the fall (476 A.D.) of the Western Roman Empire. In 752 the Lombards, a Germanic tribe, came into possession of Bologna. It remained under their control until 774, when they were subjugated by the Frankish emperor Charlemagne. Charlemagne made it a free city, and its status as such was confirmed in a charter issued by the Holy Roman Empire early in the 12th century. Meanwhile, in 1088, the University of Bologna, now the oldest university in Europe, had been founded.

In the protracted struggle during the 12th and 13th centuries between the Holy Roman emperors and the papacy, Bologna sided with the Church. The city became a member of the Lombard League (q.v.) in 1167, and fought with the League against the Holy Roman emperors Frederick I and Frederick II. In 1506, during the pontificate of Pope Julius II, it became one of the States of the Church. It remained a part of the papal territory until 1796, during the Napoleonic Wars, when it

was taken by French troops and made by Napoleon I the capital of the Cispadane Republic. It reverted to the Papal States in 1815, but in 1849 it was taken by the Austrians, who held it until their defeat (1859) by France and Sardinia made an Italian kingdom possible (see ITALY: *History*). The Bolognese, by an overwhelming vote (1860), decided in favor of annexation to Italy.

The province of Bologna lies in the s. central part of Emilia. Agriculture is the principal industry, and among the important crops are sugar beets, rice, grain, and tomatoes. The chief manufacturing industry is the production of beet sugar. The province is a stronghold of republicanism. In the national referendum held in June, 1946, for the purpose of determining the future of the Italian monarchy, the Bolognese voted against its retention by a majority of more than four to one. Area of province, 1429 sq.m.; pop. (1936) 714,705. Pop. of city (1951) 349,326.

BOLOGNA, GIOVANNI DA, Italian name of JEAN BOLOGNE or BOULLONGNE (1529?–1608), Flemish Renaissance sculptor, born in Douai. He went to Florence, Italy, in 1553, and studied under the Italian sculptor Michelangelo. In 1558 he was engaged as court sculptor by Cosimo de Medici, Duke of Florence, of whom he made a bronze equestrian statue. His works are characterized by a mastery of technique and boldness of composition. His celebrated works include a bronze figure of the Roman god Mercury, in the Bargello Museum in Florence; a beautifully proportioned fountain crowned by a figure of the Roman god Neptune, in Bologna; a marble group, "Rape of the Sabines", in Florence; and a richly ornamented door for the cathedral in Pisa.

BOLOGNA, UNIVERSITY OF, one of the oldest and most famous universities in the world. A school of law existed in Bologna in the 11th century, and the earliest statutes of the university date from 1317, with the faculty of law as the first and most important department. The university rose to great eminence in the later Middle Ages. Among its students were the Italian poets Dante Alighieri, Petrarch, and Torquato Tasso. One of the features of the later history of the university was its admission of women, as early as the 18th century. The study of anatomy was promoted by many illustrious teachers, including the Belgian anatomist Andreas Vesalius, and it was at the university that the Italian physicist Luigi Galvani made the discovery of electricity. At present the University of Bologna comprises faculties of philosophy and letters; physical, mathematical, and natural science; jurisprudence; medicine and surgery, pharmacy; veterinary surgery; an engineering school; a school of drawing and architecture; and a school of agriculture. The library, founded in 1605, contains more than 250,000 printed volumes, and many manuscripts and incunabula. In 1950–51 the student body numbered 8017, and the faculty 229.

BOLSHEVISM, a communist doctrine based on the theories of the German socialist Karl Marx as formulated by the Russian revolutionary Nikolai Lenin at the second congress of the Russian Social Democratic Labor Party held in London in 1903. The divergent viewpoints of the delegates to the congress crystallized into two factions, the more radical of which was led by Lenin. The chief disagreement was on the organization of the party. Lenin advocated a unified party of active revolutionary members, whereas his opponents proposed to admit all who declared general sympathy with the party's aims, regardless of active participation. On this point the congress supported the latter plan, but on other matters and in the final vote which elected the party leadership, the congress favored Lenin. Lenin's faction thereupon was termed the *Bolshevik* (Russ., "majority"), and the opposition was termed the *Menshevik* ("minority"), faction. These names clung, although the Bolsheviks were not always thereafter the dominant group in the Russian revolutionary movement.

The essential differences between the Bolsheviks and the Mensheviks appeared more clearly in subsequent years, when an apparent agreement on a Marxist program—the overthrow of czarism, the establishment of constitutional government, and, finally, the overthrow of capitalism and the establishment of a communist society—resulted in wide variations in practice. The Bolsheviks supported the immediate objectives only insofar as they led in the direction of the final revolutionary aim, whereas the Mensheviks, believing that Russia was unripe for revolution, placed the emphasis on reform, especially the establishment of constitutional government. To the Bolsheviks the Russo-Japanese War of 1905 appeared to be an opportunity to arouse the people for an armed revolutionary struggle. The Mensheviks, on the other hand, preferred to join with anticzarist liberals for the establishment of parliamentary institutions under czarism. When such a parliament, called the

Duma, was established in December, 1905, the Bolsheviks and Mensheviks reacted to it in different ways, the Bolsheviks at times preferring to boycott it and at other times using it as a forum from which to agitate, whereas the Mensheviks hoped to build the strength of the anticzarist forces within it.

As a result of increasing differences a final split between the two factions occurred in 1908, when the Bolsheviks formed themselves into a separate party. Thereafter the two parties, together with others, such as the Social Revolutionaries, competed for the leadership of the anticzarist revolution. The Bolsheviks used both legal and underground tactics to advance their program, building a membership, in accordance with Lenin's original specifications, of about 45,000 by March, 1917, and 240,000 by July of that year. The Bolsheviks opposed World War I as an imperialist conflict in which socialists should have no part, but the Mensheviks and Social Revolutionaries, placing national before class interests, supported and eventually attempted to take leadership in the Russian war effort. As a result of the collapse of the Russian armies and growing awareness of the inefficiency of the government, a revolution broke out in March, 1917, which resulted in the abdication of the czar and the introduction of parliamentary government. The provisional government, which included Mensheviks, was charged by the Bolsheviks with an unwillingness to expand the revolution in the direction of socialism. This task the Bolsheviks undertook through the councils (soviets) of workers and soldiers. In November, 1917, occurred the Bolshevik revolution, during which the Bolsheviks seized state power. In 1918, under the new name of the Communist Party (adopted from an earlier organization led by Karl Marx), they began their career as the dominant, and later, by decree, the sole political organization in the U.S.S.R. The subsequent history of the theory and practice of Bolshevism is indistinguishable from that of Communism. See RUSSIA: *The End of Empire*; RUSSIAN REVOLUTION; COMMUNISM: *Modern Revolutionary Communism*; UNION OF SOVIET SOCIALIST REPUBLICS.

BOLTON, or BOLTON-LE-MOORS, parliamentary, municipal, and county borough of Lancashire, England, 11 miles N.W. of Manchester. It was noted as early as the time of King Henry VIII for its cotton and its woolen manufactures. Bolton is now one of the principal cotton-weaving centers of Lancashire. Among the textile products manufactured in the city are muslins, fine calicoes, quiltings, counterpanes, and dimities. There are also foundries and ironworks, bleaching mills, chemical works, paper mills, and dye works. In the vicinity of the city are productive coal mines. At Bolton, in 1769, the English inventor Richard Arkwright invented the spinning frame, the first machine to produce firm, twisted cotton thread. The spinning mule, another device that contributed substantially to the advancement of the textile industry, was invented at Bolton by the English inventor Samuel Crompton in 1779. Pop. (1953 est.) 165,600.

BOLTON, HERBERT EUGENE (1870–1953), American historian, born in Wilton, Wis., and educated at the universities of Wisconsin and Pennsylvania. He taught history at the University of Texas from 1901 to 1909, at Stanford University from 1909 to 1911, and at the University of California from 1911 to 1940, when he became professor emeritus. Among his writings, most of which deal with the history of Spanish colonization in America and related subjects, are *The Spanish Borderlands* (1921), *Anza's California Expeditions* (5 vols., 1930), *Wider Horizons of American History* (1939), and *Cultural Cooperation with Latin America* (1940).

BOLTWOOD, BERTRAM BORDEN (1870–1927), American chemist, born in Amherst, Mass., and educated at Yale University. He taught chemistry and physics at Yale and, from 1910 until his death, was professor of radiochemistry there. In 1906 he discovered the element ionium and showed its chemical identity with thorium; this was an important step in the development of the theory of isotopes.

BOLU, capital of the il of the same name, Turkey in Asia. The town is on the Bolu R., about 90 miles N.W. of Ankara, and is the center of a fertile region producing cotton, leather, and lumber. Several miles S. of the town are hot mineral springs. To the E. are the ruins of the ancient town of Bithynium. Area of il, 4300 sq.m.; pop. (1950) 302,805. Pop. of town (1950) 7927.

BOLZANO (Ger. *Bozen*; anc. *Bauzanum*), capital of the province of the same name, Venezia Tredentina, Italy. The city is situated about 35 miles N. of Trent and 58 miles S. of the Brenner Pass. It lies at the junction of two rivers, the Talavera and the Isarco, and near a third, the Adige, and also at the junction of important routes to Italy from Germany (the Brenner route) and from Switzerland (down the Adige valley). Long noted as

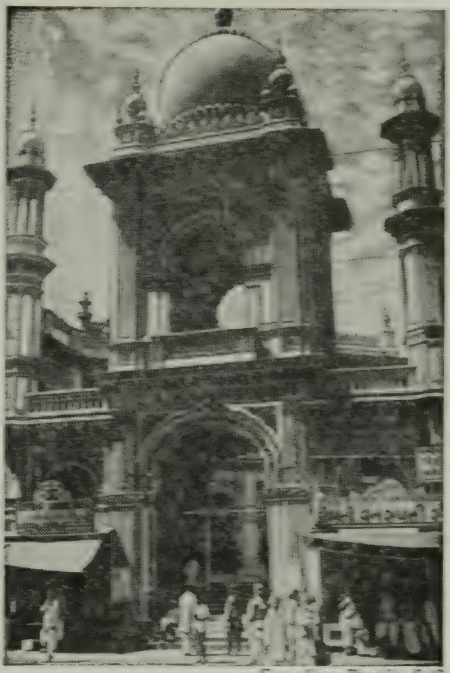
a commercial center. Bolzano has an extensive trade in the products of the province, especially fruits and wine. The city was under the control of various counts and bishops in the early Middle Ages. In 1363 it became a possession of the Hapsburg (q.v.) family. The Hapsburgs retained the city until 1918, during World War I, when it was captured and annexed by Italy. Area of province, about 3090 sq.m.; pop., about 300,000. Pop. of city (1951) 72,425.

BOMBARDIER BEETLE, common name for any of about twenty-five beetles of the family Carabidae, and in particular for those of the genus *Brachinus*. The name refers to their habit, when disturbed, of discharging an acrid fluid from the abdomen. The fluid is volatile, so that it appears as a tiny cloud of smoke, and is discharged with an audible report. *B. fumans*, a common American species, is about ½ inch in length. Its legs and narrow head and thorax are brown, and the abdomen is bright bluish purple. See GROUND BEETLE.

BOMBARDON or **BOMBARD.** See BASSOON.

BOMBAY, State of the Union of India, extending along the W. coast of the Indian peninsula and bounded on the N. by the Pakistani province of Sind and by the Rajasthan Union, on the E. by Madhya Pradesh (formerly Central Provinces and Berar), on the S. by Mysore, and on the W. by the Arabian Sea. The Western Ghats, a mountain range with elevations up to 4500 ft., parallels most of the Bombay coast. Along some sections of the coast the range, which is from 10 to 30 m. wide, is separated from the sea by a narrow coastal plain. The maximum width of the coastal plain is 50 m. The W. slopes of the range are generally steep; on the E. the range slopes gently to the elevated plains of the Deccan (q.v.) region. Besides the Deccan plains, which are extremely arid except during the rainy season, the chief level sections of Bombay are situated N. of the northern extremity of the Western Ghats and in the S.E. portion of the State. Both of these regions are arable and intensively cultivated. The N. part of Bombay is traversed by the Tapti and Narbada rivers, which empty into the Gulf of Cambay, an arm of the Arabian Sea. A number of rivers, including the Bhima and Kistna, rise in Bombay, on the eastern slopes of the Western Ghats, and flow eastward across the Indian peninsula.

During the summer season the climate of Bombay is hot and oppressive. High temperatures prevail in most parts of the State, and



Canadian Pacific S.S.

Entrance to Hamidia Mosque in Bombay city. Shops are built into its walls.

the coastal region, called the Konkan, is subject to high humidity. In the season of the southwest monsoon, extending from June to November, precipitation in the Konkan and along the western slopes of the Western Ghats often exceeds 125 inches. More moderate conditions prevail during the dry season, especially in the upland plains and in the south.

The leading industry of Bombay is agriculture, the main source of livelihood for over 61 percent of the population. Cotton is the most important industrial crop grown in the State. Among the chief food crops are rice, bajra (spiked millet), jowar (great millet), and gram. Cotton weaving is the principal manufacturing industry. Other important industries are silk weaving and the manufacture of gold and silver ornaments, metal products, and carved wooden articles. Productive deposits of salt are situated in the State. In 1952 there were 14,058 sq.m. of reserved forests, including valuable stands of teak and blackwood trees.

The region comprising present-day Bombay was the center of a flourishing culture early in the 1st millennium B.C. In the 6th century B.C. the region was overrun by the Persians. The Macedonian king Alexander the Great

subjugated it in the 4th century B.C. From the time of Alexander's withdrawal (325 B.C.) from India until the 16th century A.D. the region was ruled by a succession of Hindu and Moslem monarchs. The Portuguese, the first Europeans to penetrate Bombay, seized the town of Goa (q.v.) in 1510. During the next half century the Portuguese gained possession of numerous other towns, notably (1534) Bombay. In November, 1612, British naval vessels won a decisive victory over a Portuguese fleet in the Gulf of Cambay. The British founded a trading post at Surat in the following month. Further British naval victories during the next decade eliminated the Portuguese as effective rivals in the region. The Portuguese managed to retain their hold on the town of Bombay, but presented it, in 1661, to the British king Charles II as part of the dowry of his bride Catherine of Braganza, Princess of Portugal. In 1668 Charles II granted the town of Bombay to the British East India Company, which agreed in exchange to pay him a annual rental of £10. The company's headquarters in the region were moved from Surat to Bombay in 1708.

The Bombay holdings of the East India Company remained more or less static during the 18th century. Between 1803 and 1843, however, the company acquired numerous towns and areas in the region, including sections of Gujarat and Kathiawar, the districts known as Aden and Sind, and the towns of Poona, Belgaum, Ahmednagar, and Sholapur. Native resistance to British expansion was ruthlessly suppressed. In 1858, following the general Indian uprising known as the Indian Mutiny, the British government assumed authority over the East India Company's holdings in India. For administrative purposes Bombay was established as a presidency of British India. The agricultural industry was modernized and many other improvements were instituted in Bombay by the British government. The economy of the presidency expanded tremendously between 1862 and 1867, a period when European markets, unable to procure cotton in the United States because of the American Civil War, made heavy purchases of that commodity in Bombay. In the final years of the 19th century the presidency was devastated by successive epidemics of the bubonic plague and by disastrous famines.

The British government carried through several major administrative changes in Bombay during the 1930's. In 1932 Aden was separated from the presidency and made a province. Sind was separated from the presidency and established as a province in 1936. The remainder of the presidency was constituted an autonomous province in the following year. In 1947, when British paramountcy ended in India, Bombay became a State of the Dominion (later Union) of India. The powerful princely State of Baroda merged with the State on May 1, 1949. Bombay also absorbed the princely States of the former Gujarat States Agency, including Rajpipla, Chota Udaipur, and Baria.

The capital and largest city of the State is Bombay (q.v.). Other major cities are Ahmadabad, Poona, Sholapur, and Baroda (qq.v.). Area, 111,434 sq.m.; pop. (1951) 35,956,150.

BOMBAY, capital and largest city of Bombay State, Union of India, and chief seaport on the Indian peninsula. The city is popularly known as "the gateway of India". It is situated on and coextensive with Bombay Island, which lies about 10 m. off the W. central Indian coast. By a system of causeways Bombay Island is connected with Salsette Island, a short distance to the N., and thence with the mainland. Two major railways terminate in the city, providing service to and from all parts of India. Bombay Island, about 11 m. long in a N. and S. direction, and 3 m. wide, and Salsette Island enclose on the W. and N. Bombay Harbor, one of the best natural harbors in the world. The harbor is about 7 m. wide at its entrance and extends northward for a distance of about 14 m. Port facilities include several shipyards, five large dry docks, and numerous piers designed to provide berthage for ocean-going vessels. Bombay is a port of call for steamships operating from all parts of the world. In addition to receiving most of the imports consigned to western and central India, the port is the shipping point for the bulk of western India's exports, particularly raw cotton, cotton yarn, and such seeds as mustard, sesame, and linseed.

Bombay is one of the principal cotton-weaving centers of the Indian Union. In the year ending March, 1953, there were 64,228 looms in operation in Greater Bombay. Other leading industries are cotton ginning, bleaching and dyeing, tanning, printing and publishing, shipbuilding and ship repairing, and the manufacture of brass and copper utensils, carved wooden articles, gold and silver thread, flour, and pottery. Large railway shops are situated in the city.

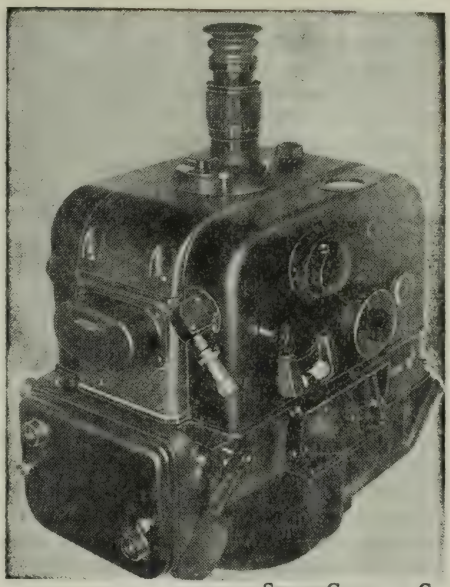
The principal business and residential sections of the city are concentrated at the S. end

of Bombay Island. One of the features of this part of the city is the Back Bay, a shallow arm of Bombay Harbor about 3 m. long and 2 m. wide, and separated from the harbor on the E. by a rocky headland called Malabar Hill. Malabar Hill is the site of the State executive mansion, and of an exclusive residential quarter. On the opposite side of the Back Bay and occupying the S. tip of the island is the native quarter, famous for its bazaars and temples. North of the native quarter is the section known as the Fort. This section contains most of Bombay's public buildings, notably the post office, many of its banks, hotels, and commercial establishments, and several of its finest edifices, including the Victoria Railway Terminal and the Institute of Science. Among noteworthy points of interest in the city is the University of Bombay, an affiliating institution with branches in Ahmadabad, Poona, Surat, Baroda, and other cities. The university, founded in 1857, maintains twenty-two colleges of arts and science, twenty-four professional schools, and several other departments. Students enrolled in the university in 1953 totaled more than 28,000. For an account of the chief events in the history of the city, see the article on the State. Pop. (1951) 2,839,270.

BOMBSIGHT, apparatus combining optical and calculating devices for aiming and releasing bombs from aircraft. The first bombsights, used during World War I, were simple devices similar to the aiming sight on a rifle. Later in the war this simple sight was replaced by a telescope with cross hairs. Gradually various mechanisms were added to correct for drift and airspeed and to aid the bombardier in making ballistic calculations.

The bombsights used by the American Air forces at the beginning of World War II (the Sperry and the Norden bombsights) consisted essentially of a telescope with cross hairs, a complex calculating machine, and a group of gyroscopes (qq.v.). A conspicuous aiming point on the target area is located in the telescope and centered on the cross hairs; the necessary information (such as size of bomb, altitude and speed of the plane, speed and direction of the wind, target motion, and atmospheric conditions) is entered on the calculating machine by manipulating various knobs and keys; the gyroscopes stabilize the bombing approach, and control of the plane is turned over to an automatic pilot co-ordinated with the bombsight. The bombs are then automatically released at the proper instant.

The accuracy of such a bombsight is high,



Sperry Gyroscope Co.

Sperry S-1 bombsight

but its operation under combat conditions may introduce bombing errors of considerable magnitude. Of all bombs dropped during World War II, about 20 percent fell within 1000 ft. of the aiming point. In 1943 less than 40 percent of bombs dropped from B-17's of the 8th Air Force landed within 2000 ft. of the aiming point; by the end of the war in Europe, accuracy had greatly improved, but still less than 75 percent of the bombs dropped by this same group fell within that distance.

Radar bombsights came into use as regular combat equipment in 1943, and made possible successful bombing on moonless nights and through heavy overcast. Since the end of the war further improvements have been made so that high-speed, high-altitude bombing can be accomplished with greater accuracy than was formerly attained at much lower speeds and altitudes. See GUIDED MISSILES.

BOMBYCIDAE, family of insects in the order Lepidoptera, characterized by stout, hairy bodies. The typical genus is *Bombyx,* the common silkworm moth. Bombycidae are closely related to the family Saturniidae, which includes the giant silkworm moths of the U.S.; according to some scientists, these two families comprise a superfamily, Bombycoidea. See SILKWORM.

BOMBYX. See SILKWORM.

BONACI, any one of several groupers. See GROUPER.

BONAPARTE, Charles Louis Napoléon. See Napoleon III.

BONAPARTE, Joseph (1768–1844), eldest brother of Napoleon I, born at Corte, Corsica. On the death of his father he exerted himself to support the younger members of the family, and went with them to Marseilles in 1793. In 1797 he was elected to the Council of Five Hundred and in the same year was sent as Ambassador from the Republic to Rome. In 1800 his brother Napoleon, having become First Consul, made Joseph plenipotentiary to conclude a treaty with the United States. He signed the Treaty of Lunéville, Feb. 9, 1801, and that of Amiens, 1802, and with Cretet and Bernier conducted negotiations relative to the Concordat. After the coronation of Napoleon, Joseph was made commander in chief of the Army of Naples, and in 1806 King of Naples. He effected abolition of feudalism, suppression of convents, building of roads, repression of banditti, and codification of laws; these reforms, however, frequently conflicted with ambitions of Napoleon.

Joseph was a man of progressive ideas, but not a vigorous ruler. In 1808 he was summarily transferred by his brother to the throne of Spain, and the French general Murat took his place as King of Naples. Joseph was not able to cope with the Spanish insurgents, backed by the power of England; after the defeat of the French at Vitoria, in 1813, he returned to his estate in France. When Napoleon recognized Ferdinand VII as King of Spain, Joseph refused at first to abdicate, but soon submitted. After Waterloo he accompanied Napoleon to Rochefort, whence they intended to sail separately for North America. In his last interview with Napoleon, Joseph offered to give up the vessel hired for his own escape, but Napoleon had determined to surrender to the English.

After a residence of many years in the United States at Bordentown, N.J., where as the Count de Survilliers he occupied himself with agriculture, in 1841 Joseph was permitted to return to his wife, who had remained in Italy. He died in Florence. His wife, Julia Marie Clary, was the daughter of a wealthy citizen of Marseilles, and sister-in-law of Bernadotte, King of Sweden. She died in Florence in 1845. By her marriage with Joseph she had two daughters: Zénaïde Charlotte Julie, who became the wife of her cousin Charles, Prince of Canino, the son of Lucien Bonaparte; and Charlotte Napoléone, who married her cousin Louis Napoleon, second son of Louis Bonaparte.

BONAPARTE, Louis (1778–1846), third brother of Napoleon I, born at Ajaccio, Corsica, and educated in the Chalons artillery school. Given various military and civil positions by Napoleon, he was made King of Holland in 1806, but in fact was never more than a French governor of Holland, subordinated to Napoleon's will. When he endeavored to resist some of the demands of the Emperor, Napoleon insisted on his submission, sent troops to Holland, and in 1810 annexed that country outright to France. Louis made no forcible resistance, abandoned his throne, fled to Bohemia, and finally settled, as Comte de Saint-Leu, at Rome, where he devoted himself to literature. His wife was Hortense Eugénie Beauharnais, Napoleon's adopted daughter, and one of their sons became Napoleon III (q.v.). Louis wrote *Marie ou les Hollandaises,* a novel sketching Dutch manners, and other works.

BONAPARTE, Napoléon. See Napoleon I.

BONAPARTISTS, designation applied to the supporters of the movement to restore a member of the Bonaparte family to the French throne. The movement was essentially in conflict with French republicanism, and with the movements organized by Bourbon (q.v.) and Orléans (see Orléans, Dukes of) claimants to the throne. However, in the political struggles that developed after Louis Philippe's election (1830) as king, the Bonapartists allied themselves with one or another of these groups, as partisan advantage dictated.

By a decree adopted by the French Senate in November, 1804, the right of succession to the imperial throne was restricted to the offspring of Emperor Napoleon I and to his brothers, Joseph and Louis Bonaparte, and their offspring. The other two brothers of Napoleon I, Lucien and Jérôme Bonaparte, were excluded from the right of succession because their wives were officially regarded as unacceptable. After the exile of Napoleon and the restoration (1815) of the Bourbon line in the person of Louis XVIII, the decree of 1804 was rescinded; thenceforth all the heads of the Bonaparte family were pretenders to the throne. With the death in 1832 of the Duke of Reichstadt (Napoleon II), the only son of Napoleon I, leadership of the Bonaparte family passed to Louis Bonaparte's son, Charles Louis Napoléon Bonaparte, known as Louis Napoleon, who became the central figure of the Bonapartist movement (see Napoleon III). In 1848 Louis Napoleon was elected president of France. With his proclamation of

himself as Emperor Napoleon III (1852), Bonapartist objectives were fully realized.

After the deposition (1871) of Napoleon III by the National Assembly, the Bonapartist movement rapidly lost significance in French political life. The chief claimant to the French throne after the death (1873) of Napoleon III was his son, Eugène Louis Jean Joseph Napoléon, known as the "Prince Imperial". With his death in 1879, leadership of the Bonaparte family passed to Jérôme Bonaparte's son, Napoléon Joseph Charles Paul Bonaparte, who was exiled from France in 1886 with his son Prince Victor Bonaparte (1862–1926). Prince Victor, last of the Bonapartist pretenders, left no heirs.

BONASUS, or BONASSUS. See BISON.

BONAVENTURA, SAINT (1221–74), Italian prelate and theologian, born in Bagnarea as Giovanni di Fidanza. About 1242 he entered the religious order of Franciscans, and was sent by his superiors to study at the University of Paris; he became professor of theology at the university in 1253. Four years later he was elected minister general of the Franciscan Order. He introduced reforms into the constitutions of the order, and settled the dispute between the *Spirituales* and the *Relaxisti,* two contending groups of friars. In 1273 Pope Gregory X created him cardinal bishop of Albano. Bonaventura died the following year while attending the second session of the Council of Lyons. He was canonized by Pope Sixtus IV in 1482, and was designated as the sixth of the great doctors of the church by Pope Sixtus V in 1587. The sublimity of his teachings earned him the popular designation of "Seraphic Doctor". His feast day is July 14. Among his most important works are the *Breviloquium,* the *Itinerarium Mentis in Deum,* and *De Reductione Artium ad Theologiam.*

BONAVENTURE, river of Quebec Province, Canada, entering Chaleur Bay near New Carlisle. It is about 60 m. long and is well stocked with salmon and trout.

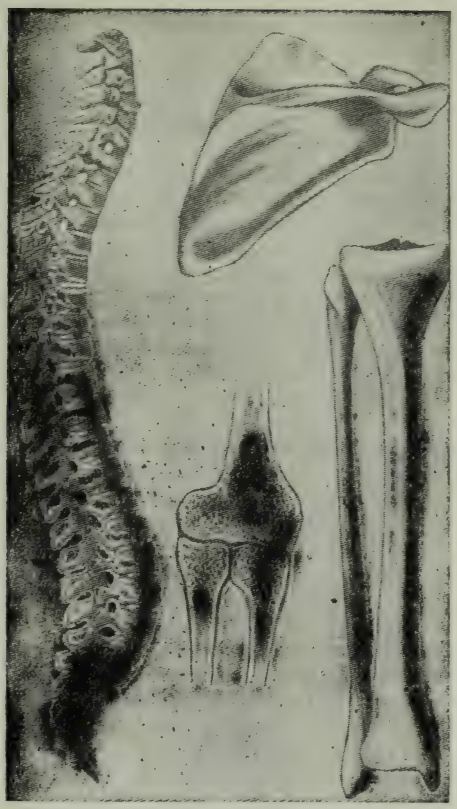
BOND. Two kinds of bonds are known to law and commerce—performance and investment. A performance bond is required when the nonperformance of an act by one party to an agreement will cause loss to the other. The face value of the bond includes the penalty (for nonperformance of the act), and formerly it was possible to recover the full penalty. Now, however, the courts of equity do not permit a man to take more than in conscience he ought: his principal, interest, and expenses, in case of the forfeiture of the bond by nonpayment of money borrowed, or the damages sustained by nonperformance of a covenant, etc. A bond dormant for 20 years cannot afterward be recovered.

Investment bonds are generally of five kinds: government, municipal, railroad, public utility, and industrial. Government bonds are not secured by mortgage, as are other bonds, but rest for their security upon the buyer's confidence in the taxing power and stability of the issuing government. Municipal bonds, which include bonds of other political divisions, such as states, counties, cities, townships, school districts, etc., are issued either as the direct obligation of the entire issuing body, or (special assessment bonds) are to be retired by the levy of special taxes on the property to be improved. Railroad bonds are secured by mortgage on the railroad's property, a special form of this bond being the Equipment bond, secured only by the rolling stock or other specified equipment of the company. Public utility bonds include those of urban and interurban transportation, gas, electric light and telephone companies, and the like, often, as well, of companies furnishing water, sewage, docking, and other public service under legal regulation and frequently under monopoly. Industrial bonds include the bonds of nearly all corporations other than of the types given above. A bond is not enforceable if granted for immoral or illegal consideration; likewise if it is against public policy, for example marriage brokage bonds. A bond is also invalid if the obligor has been induced to grant it through coercion or fraud.

See also FINANCE: *Private Finance.*

BOND, CARRIE JACOBS (1862–1946), American song writer and author, born in Janesville, Wis., and educated in the local public schools. She wrote the words and music of over 175 popular and semiclassical songs; among the best-known are "A Perfect Day" (which sold over a million copies), "Just A-Wearyin' for You", and "I Love You Truly". Among her writings are the autobiography *Roads of Melody* (1927) and a number of books for children.

BOND, WILLIAM CRANCH (1789–1859), American astronomer, born in Portland, Me., and largely self-educated. He erected one of the first private observatories in the United States. In 1840 he became director of the observatory at Harvard University, and, with his son George Phillips Bond, he discovered a



HUMAN BONES. *Left: Spinal column. Top: Shoulder blade. Center: Cross section of elbow joint. Right: Lower-leg bones.*

satellite of Neptune and the eighth satellite of Saturn. He is the inventor of the electrochronograph, an instrument for electrically recording time intervals, and was among the first to employ photography in stellar observations. His writings include *On the New Ring of Saturn* (1851) and *Observations of Solar Spots 1847–49* (1871).

BONE, rigid supporting and connective tissues constituting the principal component of almost all adult vertebrate skeletal structures, and existing in dense and spongy forms, known respectively as *compact* and *cancellous* bone; see SKELETON. It is distinguished from another type of firm connective tissue, known as cartilage or gristle. A chemical mixture of inorganic salts (65 to 70 percent) and various organic substances (30 to 35 percent), bone is both hard and elastic. Its hardness is derived from inorganic constituents, principally calcium phosphate and calcium carbonate, with small amounts of fluorides, sulfates, and chlorides; its elasticity is derived from such organic substances as gelatin, collagen, and trace amounts of elastin, cellular materials, and fats. Internal tubular structures, called *Haversian canals,* contain nerve tissues and blood vessels which provide bones with organic nourishment. Surrounding these canals is a somewhat porous tissue, built up of thin plates, known as *lamellae,* and usually containing cavities filled with *marrow.* The external portions of bones, enclosing all the components mentioned above, include the most compact and hardest of all bone tissues, and are in turn generally sheathed by a vascular, fibrous membrane, known as the periosteum (q.v.).

In the disease called rickets (q.v.), the mineral matter is deficient, and the two flexible leg bones bend under the weight of the body. In aged people the bones are more densely packed with mineral matter and become brittle, rendering them particularly liable to fractures.

Animal bone is used for many purposes. The gelatin and marrow are used in the preparation of soups, soup stocks, and gelatin products. Buttons and handles for cutlery and brushes were generally made of bone before the introduction of plastics. Animal bone is extensively used as a fertilizer; see BONE FERTILIZERS.

BÔNE, a fortified seaport town in North Algeria. It is situated on a bay of the Mediterranean at the foot of a hill near the Seybouse River. It has been much improved since occupation by the French in 1832, and is surrounded by walls flanked with towers and further defended by Fort Cigogne, on the top of the hill. The ancient fortress has been used as a prison for persons sentenced to deportation from France. Bône has good bazaars; manufactures tapestry, saddlery, and native clothing; and trades in cattle, sheep, wool, hides, corn, coral, fish, olive oil, tobacco, and wax. In the vicinity are valuable iron mines, marble quarries, phosphate beds, and cork woods. There is telegraphic communication with Marseille, and regular steam connection with France, Algiers, and Tunis. A fine harbor is visited annually by nearly 3000 ships. A railroad connects the city with Algiers, Constantine, and Biskra. Near Bône, the ancient Aphrodisium, are the remains of the once famous city of Hippo Regius, favorite residence of the Numidian kings and the episcopal see of St. Augustine, who died there in 430. Pop. (1948) 102,823.

BONE, HENRY (1755–1834), English enamel painter, born at Truro, Cornwall. In 1801 he was appointed enamel painter to King George III, and elected associate of the Royal Academy. In 1811 he exhibited his large work "Bacchus and Ariadne", after Titian, which was sold for over $11,000, and is now in the National Gallery, London. Among his other works are "Death of Dido", and "Hope Nursing Love", after Sir J. Reynolds.

BONE, SIR MUIRHEAD (1876–1953), British artist, born in Glasgow, and trained as an architect at the Glasgow School of Art. Early in his career Bone abandoned architecture for painting and etching. His reputation was established through his first London exhibition of etchings in 1903, and his eminence as an artist was formally recognized by the British government during World War I, when he served as official artist on the Western Front (1916) and with the Grand Fleet (1917–18). He was knighted in 1937, and in 1940 was appointed official artist to the Admiralty. Bone is generally considered one of the finest etchers of his time, and a notable draughtsman in the media of pencil, charcoal, and sepia. Among his best-known etchings are "The Great Gantry", "The Shot Tower", and "Liberty's Clock"; his etchings and drawings are included in numerous public and private collections.

BONE FERTILIZERS, bone processed in various ways to serve as a source of minerals to promote plant growth. Bone, particularly rich in phosphorus and containing some nitrogen, has been used as a fertilizer material for centuries.

Raw bone, scraped of meat and excess fat, contains about 22% of phosphoric acid in the form of tricalcium phosphate. The presence of residual fat, however, retards the leaching of phosphorus into the soil. *Bone tankage* is a mixture of slaughterhouse refuse, mostly raw bones with blood and scraps of lean meat. It is a better source of nitrogen than other bone fertilizers.

To remove the fat and gelatin (both valuable by-products) from raw bones, the bones are boiled or steamed, and the resulting product is known as *steamed bone,* containing about 30% phosphorus and 1.5% nitrogen. Bones are also washed with solvents to remove fat. Formerly *dissolved bones,* produced by the action of strong sulfuric acid, were much used as fertilizer, but this product has been largely replaced by superphosphates. Most bone fertilizers, whether raw or treated, are ground into *bone meal* or *bone dust.*

Two other bone products sometimes used in agriculture are *bone ash,* made by burning bones, and *bone black.* Both are almost entirely lacking in nitrogen, but bone black, which is included in mixed fertilizers after it has been used in the refining of sugar, contains valuable protein material from the sugar. See FERTILIZERS.

BONESET. See EUPATORIUM.

BONGO. See DOR.

BONHEUR, ROSA, full name MARIE ROSALIE BONHEUR (1822–99), French painter, born in Bordeaux, and trained in Paris under her father Raymond Bonheur (d. 1849). Her first important painting, "Ploughing in Nivernais" (1848), was acquired by the French government for the collection of the Luxembourg Gallery, in Paris. In subsequent years Rosa Bonheur established a reputation as one of the foremost animal painters of her day. Her best-known work is "The Horse Fair" (Metropolitan Museum of Art, New York City). In 1894 she received the grand cross of the French Legion of Honor, becoming the first woman to win this honor. Among her other paintings are "A Limier-Briquet Hound", "Deer in the Forest", and "Weaning the Calves" (Metropolitan Museum of Art, New York City); "Deer Drinking" (New York Public Library); and other works included in collections in France, England, and the United States.

BONHOMME RICHARD, flagship commanded by the American naval officer John Paul Jones during a famous sea battle of the Revolutionary War. The ship, a decrepit merchantman called the *Duras,* was a contribution of the French government to the American cause; it was renamed after the "Poor Richard" of the American statesman and scientist Benjamin Franklin's famous *Poor Richard's Almanac.* On the night of Sept. 23, 1779, Jones' squadron of five ships encountered, in the North Sea off Flamborough, England, a fleet of forty-one British merchantmen convoyed by two powerful men-of-war, the *Serapis* and the *Countess of Scarborough.* The *Countess* was captured by vessels of Jones' force; the *Serapis* was engaged by the *Bonhomme Richard.* After a desperate fight lasting 3½ hours, during which Jones had the *Bonhomme Richard* lashed to the *Serapis* so that the British man-of-war could not fully utilize its far greater firing power, the commander of the *Serapis* surrendered. The *Bonhomme Richard,* unseaworthy from the outset, was so badly damaged in the battle that two days later she sank. Jones's victory gave the newly formed

Metropolitan Museum of Art

"The Horse Fair," famous painting by Rosa Bonheur. Portrait of her is at left.

United States of America considerable prestige. In recognition of his exploits against the British, King Louis XVI of France presented him with a gold-mounted sword and decorated him with the Order of Military Merit. Jones received a gold medal from the Continental Congress following his return to America.

BONIFACE, the name of 9 popes, the most important of whom were: **1.** BONIFACE I (about 350–422), Bishop of Rome or Pope from 418, born in Rome. When his predecessor, Zosimus (q.v.) died, Boniface and Deacon Eulalius were consecrated Pope by rival factions of the clergy. The Roman Emperor Honorius decided in favor of Boniface. Boniface was noted for his efficient organization and strict rule. In St. Augustine's conflict against the heresy of Pelagianism (q.v.), Boniface supported Augustine. After his death Boniface was considered a saint; his feast day is October 25. **2.** BONIFACE VIII (1235?–1303), Pope from 1294, born at Anagni, Italy. His real name was Benedetto Caetani. He was the founder of the University of Rome. The medieval papacy reached its height during his pontificate, but by the end of his reign, the papacy was no longer able to withstand the growing power of the monarchs and nations developing in Europe toward the end of the Middle Ages. He sought to exercise both temporal and spiritual authority in all Catholic lands, and to accomplish this aim issued two important bulls: *Clericis Laicos* (1296), in which he forbade the payment or collection of taxes on ecclesiastical property without the consent of the pope; and *Unam Sanctam* (1302), wherein he asserted the supremacy of the pope over all rulers, in temporal as well as spiritual affairs. On the issue of papal supremacy Boniface came into conflict with a number of European rulers, notably Philip IV of France. In 1303 Boniface was about to excommunicate Philip for his disobedience of the bulls, when supporters of the king, together with Italian enemies of Boniface, made the Pope prisoner at Anagni. Although soon liberated, Boniface, exhausted by this experience, died shortly afterward in Rome. **3.** BONIFACE IX (d. 1404), Pope from 1389, born in Naples. His real name was Piero Tomacelli. He ruled the city of Rome with almost absolute power. He brought Naples, which supported the popes at Avignon (see SCHISM, WESTERN), back into the jurisdiction of the popes at Rome. Boniface IX strengthened the papal states and prepared them for the role they played in politics in the 15th century. He was the founder of the University of Ferrara.

BONIFACE, SAINT, original name WINFRID or WYNFRITH (about 680–755), English Benedictine missionary, known as the "Apostle of Germany", born in Crediton, Devonshire, and educated at the monastery in Nursling, Hampshire. He became an abbot in that institution about 717. In 718 he was authorized by Pope Gregory II to preach Christianity to all the tribes of Germany. Boniface traveled through Thuringia, Bavaria, Fries-

land, Hesse, and Saxony. In 723 the pope called him to Rome, consecrated him bishop, and furnished him with letters to Charles Martel, Frankish ruler of Austrasia, and all princes and bishops, requesting their aid in his pious work. Returning to Hesse (724), Boniface destroyed the objects of heathen worship and founded churches and convents. In recognition of his services, Pope Gregory III named him archbishop and primate of all Germany, with power to establish bishoprics wherever he saw fit. Boniface then made a third journey to Rome (738), and was appointed papal legate for Germany. He was killed at Dokkum, West Friesland, by a band of heathens. His feast day is June 5.

BONIFAZIO VERONESE, properly BONIFAZIO DI PITATI, sometimes called BONIFAZIO VENEZIANO (1487–1553), Italian Renaissance painter, born in Verona, and trained in Venice under the Italian paiter Jacopo Palma. Bonifazio Veronese was an outstanding member of the Venetian School of Renaissance art. Among his early works are a number of religious paintings known as "Sante Conversazioni", now included in such collections as those in the Pitti Palace (Florence), the Ambrosiana (Milan), the National Gallery (London), the Louvre (Paris), and the Museum of Vienna, and in the Gardner Collection (Boston). The best known of his later works are "Flight into Egypt" (Pitti), "Rich Man's Feast" (Academy, Venice), and the "Finding of Moses" (Brera, Milan). His most important commission was the decoration of the Palazzo Camerlenghi with a large number of paintings, most of which are now in the Venetian Academy and the Museum of Vienna.

BONINGTON, RICHARD PARKES (1801?–28), English historical, genre, and landscape painter, born in Arnold, near Nottingham, and trained in Paris at the École des Beaux-Arts and privately under the French historical painter Antoine Jean Gros. He spent much of his life in France, and was one of the first painters in that country to adopt the techniques of such English landscape painters of the period as John Constable; after Bonington's death, his paintings strongly influenced the style of the French Barbizon School (q.v.) of painting. Among his works are "Henry IV and the Spanish Ambassador" (Wallace Collection, London), "Francis I and the Duchesse d'Étampes" (Louvre, Paris), "Coast Scene, Normandy" and "Roadside Halt" (both in the Metropolitan Museum of Art, New York City), and "Grand Canal in Venice".

BONIN ISLANDS or (Jap.) **OGASAWARA ISLANDS,** also known as BONINS, group of fifteen small, volcanic islands in the Pacific Ocean, situated about 600 miles S.S.E. of the Japanese mainland, and formerly part of Tokyo Prefecture, Japan. The principal islands are Chichi Jima, Haha Jima, Ototo Jima, Muko Jima, and Yome Jima. Sugar cane, pineapples, and bananas are cultivated, and there are valuable stands of timber, notably palm, cedar, ironwood, boxwood, rosewood, and sandal trees. During World War II the islands were frequently bombed by Allied planes. After the surrender of Japan in August, 1945, the Bonins remained under the control of the United States forces. Area, 40 sq.m.; pop. (1940) 7361.

BONN, capital of West Germany and city of the West German State of North Rhine-Westphalia, situated on the Rhine R., about 16 miles S.E. of Cologne. Among the points of interest in Bonn is the imposing Münster, a notable example of the late Romanesque style. It dates from the 13th century, and was restored in 1875. Secular buildings include the Rathaus, completed in 1782; the famous Beethoven House, where the composer was born in 1770, and which now contains the Beethoven Museum; and the buildings of the University of Bonn. The city is an important industrial center; machinery, chemicals, cement, porcelain, and jute are manufactured.

Bonn, the *Bonna* or *Castra Bonnensia* of the Romans, was one of the first Roman fortresses on the Rhine. The town was destroyed by the Normans in the 9th century. Rebuilt, it acquired some importance when, in 1267, the archbishop of Cologne transferred his residence and seat of government to the town. Two German kings were crowned in the Münster in the 14th century. Because of its Protestant sympathies Bonn was repeatedly besieged by the Catholics in the course of the strife accompanying the Reformation. The French occupied Bonn in 1794, during the French Revolutionary Wars. Under French rule, which was recognized by the Treaty of Lunéville (1801), the prosperity of the city declined. Bonn was recovered by Prussia in 1814. From the close of World War I until January, 1926, Bonn was in the zone of Allied occupation. The city was severely bombed by Allied planes in 1944 and 1945, during World War II American troops captured Bonn on March 9, 1945, and after the close of the war it was allocated, along with the remainder of Prussian Rhineland, to the British Zone of Occupation. In September, 1949, Bonn became capital of

the newly formed republic of West Germany. Pop. (1950) 115,394.

BONNARD, Pierre (1867–1947), French painter, born in Paris, and trained at the Académie Julien, Paris. Before devoting himself entirely to easel painting, Bonnard worked as a book illustrator, lithographer, and stage designer. He is generally recognized as one of the leading members of the Impressionist school of French painters (see Impressionism, in painting), and his works are included in the collections of numerous European galleries, and in many private collections. The Museum of Modern Art, New York City, the Brooklyn Museum of Art, the Philadelphia Museum, the Phillips Galleries of Washington, D.C., and other important institutions in the United States exhibit his paintings.

BONNAT, Léon Joseph Florentin (1833–1922), French painter, born in Bayonne, and trained in Madrid and Paris. His early works consist mainly of religious paintings and genre studies; after 1875 he became a noted portrait painter. Bonnat painted about two hundred portraits, including among his subjects such French notables of his day as the historian and politician Louis Adolphe Thiers, the critic Hippolyte Adolphe Taine, the author Victor Hugo, and the scientist Louis Pasteur. His work is included in the collections of a number of American museums, among them the Metropolitan Museum of Art, New York City. He was elected to the Institute of France in 1881.

BONNER or **BONER,** Edmund (1500?–69), English prelate, educated at Oxford University. Ordained a priest in 1519, he became chaplain to Cardinal Thomas Wolsey, Lord Chancellor of England, in 1529. The following year, when Wolsey was arrested on a charge of treason, Bonner entered the service of King Henry VIII. In 1532 Bonner appeared before Pope Clement VIII at Rome in defense of the king's divorce of Catherine of Aragon, and, in 1533, after the pope excommunicated Henry for his marriage to Anne Boleyn, he carried to the pope Henry's notice of intent to appeal from the papal authority to a general council. He was made bishop of London in 1539, and during Henry's reign supported the doctrine of the supremacy of the king (see Supremacy, Royal) in both spiritual and temporal affairs. However, Bonner partially repudiated this position when Edward VI succeeded Henry (1547), and he was therefore imprisoned (1549). On her accession in 1553 Queen Mary, a Catholic, released Bonner. He figured prominently in the persecution of English Protestants that marked her reign. When Elizabeth, a Protestant, became queen (1558), he refused to take the oath of supremacy; he was removed from office and imprisoned until his death.

BONNET, Charles (1720–93), Swiss naturalist and philosopher, born in Geneva. He was educated in the law, but devoted himself to science. His dissertation on aphids, in which parthenogenetic reproduction was described for the first time, won him, at the age of twenty, the honor of being made corresponding member of the French Academy of Sciences; in 1743 he was elected a fellow of the Royal Society. About 1754 approaching blindness caused him to turn from research to philosophy. Among his works are *Traité d'Insectologie* (1745), *Contemplation de la Nature* (1764–65), and *Recherches Philosophiques Sur les Preuves du Christianisme* (1773).

BONNET, Georges (1889–), French statesman, born in Bassilac, Dordogne, and educated at the École des Hautes Etudes and the École des Sciences Politiques, Paris. Between 1925 and 1936 Bonnet held a number of high government posts, serving at various times as minister of the budget, public works, finance, and commerce. He was ambassador to the United States in 1937, and in the same year again became minister of finance. He was minister of foreign affairs, and nominally in charge of French foreign policy, during the negotiation of the Munich Pact (q.v.) in 1938. In 1939, shortly after the beginning of World War II, Bonnet became minister of justice, and in 1941, after the fall of France, and during the period of German domination, he was minister in the collaborationist National Council of France formed by Marshal Henri Pétain. The French Radical-Socialist Party, of which he had been a member for decades, expelled him in June, 1944. He was elected to the National Assembly in December, 1955, and re-elected in January, 1956.

BONNEVILLE, Benjamin Louis Eulalie de (1796–1878), American soldier and explorer, born in Paris, France, and educated at the United States Military Academy. In 1831 he obtained a leave of absence from the army and organized an expedition for the purpose of exploring the Rocky Mountains. The expedition did not return to civilization until 1836. Bonneville's records were edited by the American author Washington Irving and published as *The Adventures of Captain Bonneville, U.S.A., in the Rocky Mountains and the Far*

West (2 vols., 1837). Bonneville was promoted to the rank of lieutenant colonel for gallantry during the Mexican War. Shortly before the outbreak of the Civil War he retired, but on the opening of hostilities he re-entered the Federal army and was placed in command of the army post in St. Louis, Mo. In 1865 he was raised to the rank of brigadier general. Bonneville Lake (q.v.) was named in his honor.

BONNEVILLE DAM. See DAMS: *Masonry Dams.*

BONNEVILLE LAKE, designation applied to a vast fresh-water lake or inland sea existing in the prehistoric Pleistocene epoch, and covering the northwestern part of present-day Utah. It had an area of about 20,000 sq.m. and a depth of 1000 feet. Climatic changes or volcanic disturbances caused the lake to fall below its lowest outlet; it subsequently evaporated, leaving the arid depression known as the Great Basin and a shrunken remnant, now Great Salt Lake. In this process, about 6,000,000 tons of salt, and other minerals, were left in deposits or held in solution in the waters of Great Salt Lake. Bonneville Lake was named in honor of the American explorer Benjamin Bonneville.

BONN, UNIVERSITY OF, one of the leading German institutions of higher education, situated in Bonn, West Germany. It was founded as an academy in 1777 by Maximilian Frederick, Archbishop of Cologne. In 1784 Holy Roman Emperor Joseph II made it a university. The institution was suppressed by the French after 1797, during the Revolutionary and Napoleonic wars. In 1818 the university was reorganized under the auspices of King Frederick William III of Prussia. The modern university comprises colleges of theology, law, medicine, philosophy, mathematics, and natural science. The library contains over 500,000 volumes, 1000 incunabula, and 1800 manuscripts. In a recent year the student body numbered over 5000.

BONSAL, STEPHEN (1865–1951), American newspaper correspondent, born in Baltimore and educated abroad at Heidelberg, Bonn, and Vienna. He was a correspondent for the New York *Herald* in the war between Bulgaria and Serbia in 1885, in the Macedonian uprising of 1890, and in the Sino-Japanese War of 1895; and for the New York *Times* in Mexico in 1910–11. In 1891–96 he was in the American diplomatic service in Peking, Madrid, Tokyo, and Korea; and in 1913 he became executive secretary to the Governor General of the Philippine Islands (F. B. Harrison). He was an observer with Hindenburg's army at the Eastern Front in 1915, at the beginning of World War I. Later in the war he served with the American forces in France. He traveled through Soviet Russia in 1931, and through North China and Manchuria in 1934. His book *Unfinished Business* won for him the Pulitzer Prize in history in 1945. Among his other works are *Heyday in a Vanished World* (1937), *When the French Were Here* (1945), and *Suitors and Suppliants: The Lesser Nations at Versailles* (1946).

BONTOK IGOROT, exogamous, head-hunting people living in the subprovince of Bontok, N. central Luzon Island, Philippine Islands, and comprising an important subtribe of the Igorot, the aboriginal inhabitants of the region. The Bontoks live in the mountainous interior of the island where game is scarce, and subsist on rice and other crops which they cultivate intensively. Their ancient customs have been modified under the influence of Episcopalian missionaries. See IGOROT.

BONY, village of the department of Aisne, France, about 10 miles N.W. of St. Quentin. On Sept. 29, 1918, during World War I, Bony was the scene of a violent battle between Anglo-American and German troops. The village is the site of an American military cemetary with over 1800 graves. Pop., about 100.

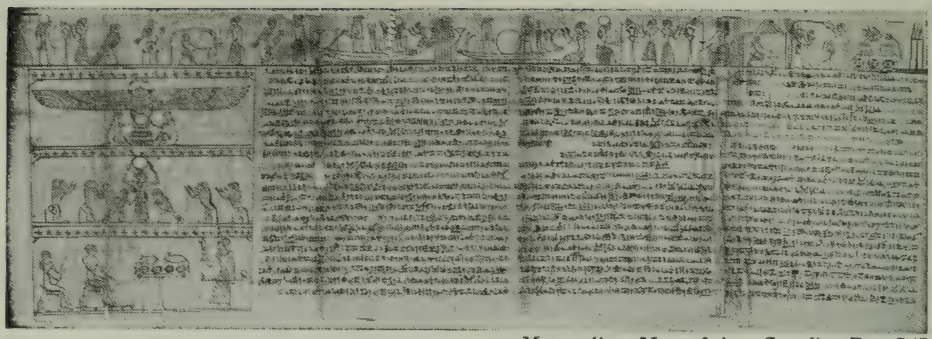
BOOBY, any of the large sea birds of the genus *Sula* in the gannet family. Though the boobies are largely tropical birds, some species are occasionally found as far north as Long Island on the Atlantic Coast. They are common in Florida.

The common or white-bellied booby, *S. leucogaster,* is a brown bird about 30 in. long with a white breast. The blue-faced booby, *S. dactylatra,* is white with yellow bill, orange legs and feet, brown wings and tail, and a bluish tinge to the naked skin of the face and neck. Another species, *S. variegata,* is valuable for the guano (q.v.) that it leaves on islands off the coast of Peru.

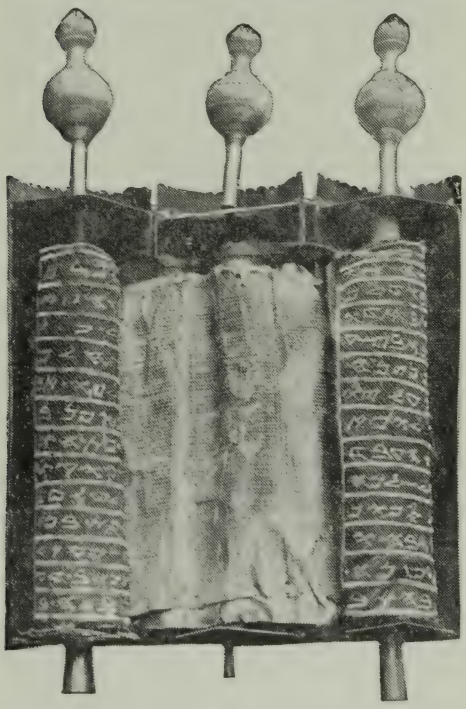
Boobies nest near the shore in roughly built nests placed on the ground or in shrubs or low trees. They were named for the supposed stupidity with which they landed on the ships of early British mariners and allowed themselves to be caught. They have caused trouble on tropical airfields by nesting on runways.

BOOGIE-WOOGIE. See JAZZ.

BOOK, in modern general usage, a printed volume, usually bound, containing a literary work, historical or other records, statistical,



Metropolitan Mus. of Art; Canadian Pac. S/S



EXAMPLES OF ANCIENT BOOKS

Above: Portion of the Book of the Dead, an Egyptian papyrus roll of about 332–30 B.C. Left: Parchment roll containing two Old Testament books, dating from about 1 A.D., preserved in a chapel in Nablus, Palestine.

mathematical, or other data, pictorial representations, musical scores, or combinations of a number of these elements. The term is also applied to the major divisions of the Old Testament, as *The First Book of Moses* (*Genesis*), and to the major divisions of a literary work, as "the six books" of the *Aeneid* by Vergil. By extension it is applied to volumes containing blank pages or prepared forms for the keeping of records (see BOOKKEEPING). Books containing maps and geographical data are called atlases and gazetteers.

Books as historical records; as vehicles for the expression of thought and feeling, either directly or in the form of imaginative writing; and as mediums for the deposit and dissemination of knowledge, have both reflected and tremendously influenced the development of civilization. Some scholars consider as the earliest books the graven clay and stone tablets and polygonal cylinders of the ancient Assyrians, Babylonians, and Chaldeans, and of other peoples of remote antiquity. The Code of Hammurabi (see HAMMURABI), accounted one of the most important records in the history of mankind, was carved on a block of stone.

But the consensus of authoritative opinion considers as the earliest books the papyri rolls of hieratic writing of the Egyptians of the 3rd millennium B.C., containing both sacred and profane texts. The oldest known book, from this point of view, is thus the papyrus roll known as *The Proverbs of Ptahhotep,* containing the maxims of the sage Ptahhotep who flourished about 2650 B.C. Another early book was the *Book of the Dead* (q.v.).

Papyrus, unlike leather which was also used in antiquity as a writing material, was easily and cheaply produced, and was well adapted to writing purposes. Its use spread from Egypt to Greece and Rome and other parts of the world.

A papyrus book consisted at first of a number of papyrus sheets, glued or otherwise fastened together to form a continuous strip, each end of which was affixed to a cylinder made of wood, ivory, or bone. The strip was rolled around one of the cylinders by means of knobs attached to the ends of the cylinder, and had to be unrolled as it was read. Writing was generally done with a reed pen, in narrow col-

umns with little space between them, and on one side of the papyrus. Papyrus books were of varying length, the longest extant strip being the Harris Papyrus, 133 feet long and 17 inches high.

Inconvenience in handling the strips in reading, and in locating passages in them, led to the use, probably in the first century A.D. but possibly earlier, of the square-shaped book called *codex* by the Romans. The codex, which probably originated in Greece or Asia Minor, consisted of a number of sheets folded in the middle to form quires, which were laid one upon the other, stitched with thread, and then bound. The columns of writing in the codex were wider than in the papyrus scrolls. With respect to general shape, binding, and the eventual use of one or two columns to the page, the codex was the progenitor of the modern book. The term *codex* occurs in the title of a number of celebrated editions of the Bible as in *Codex Sinaiticus*.

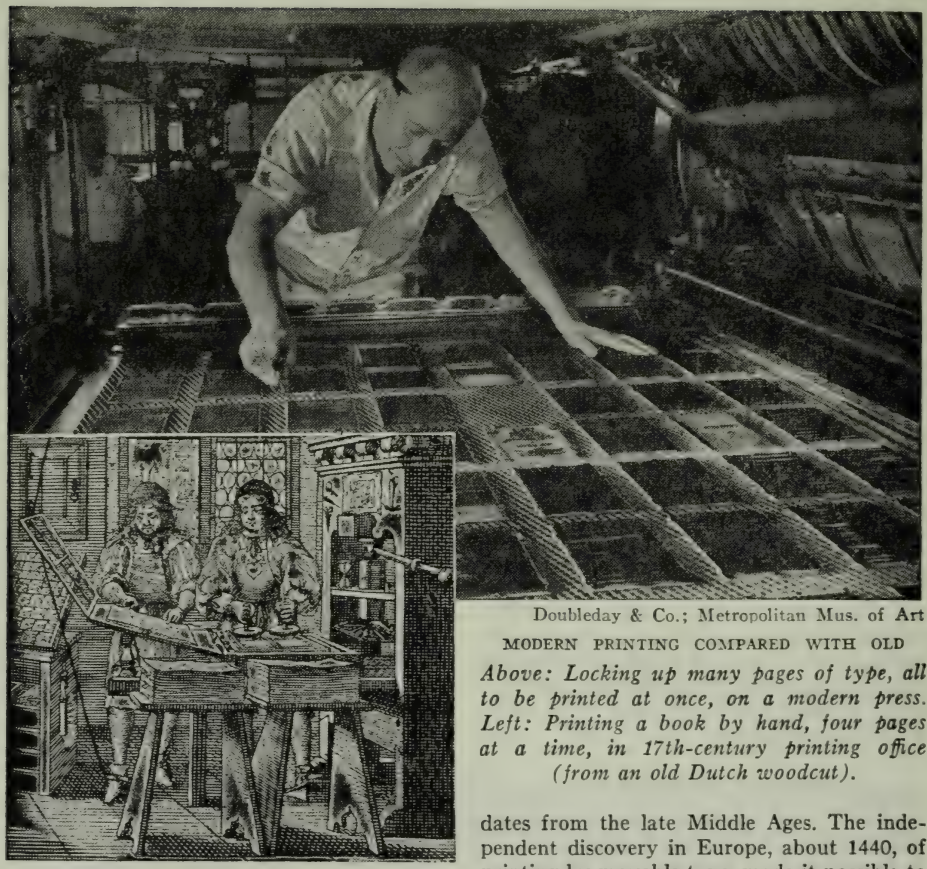
With the development of the codex, books, hitherto the possessions principally of temples, kings, and wealthy men, became the property of a growing number of private individuals, but the general lack of education among the masses of the people, and the difficulty of writing out copies, made a truly wide distribution impossible.

Papyrus was sensitive to dampness, and, except in Egypt where the climate was dry, disintegrated in less than a hundred years. As a result, a great part of the literature and records of the ancient world have been irretrievably lost. For greater durability, the ancient Greeks and Romans used writing tablets made of a wide variety of materials, including wood, ivory, and bronze and other metals; the Romans coated hinged tablets called diptychs with wax, on which they wrote with styluses to record business accounts. Papyrus, however, remained in use as a book material until the 10th century A.D.

Parchment was long in use as a writing material among the Hebrews, Persians, and other ancient peoples before its preparation was improved by King Eumenes II of Pergamum in the 2nd century B.C. Thereafter its use was widely extended, and in the 4th century A.D. it supplanted papyrus as the principal writing and book material. But although superior to papyrus as a book material, parchment was also highly perishable and was in turn supplanted by paper made of linen rags, a writing material introduced into Europe from Asia in the 10th century A.D.

In Europe, in the early Middle Ages, books were written chiefly by churchmen. Copies were made laboriously by scribes trained in

Scholar and calligrapher of the Middle Ages inscribing a book



Doubleday & Co.; Metropolitan Mus. of Art

MODERN PRINTING COMPARED WITH OLD

Above: Locking up many pages of type, all to be printed at once, on a modern press. Left: Printing a book by hand, four pages at a time, in 17th-century printing office (from an old Dutch woodcut).

calligraphy, who worked in *scriptoria* in monasteries. During the revival of learning instituted in France by Charlemagne in the 8th century, the scribes developed a fine Latin script which later was used as the basis of a number of modern type faces. Medieval books were frequently illuminated (see ILLUMINATED MANUSCRIPTS) and finely bound with richly decorated materials. In this period bookmaking became a fine art, but books were expensive and for this reason as well as because of the prevailing illiteracy of the time, the use of books was greatly limited. A celebrated example of the bookmaker's art of this time is the *Book of Kells*, an illuminated copy of the Gospels, written in Latin, in Ireland, probably in the 8th century A.D., and now preserved in Trinity College, Dublin.

The first book known to have been printed from wood blocks appeared in 868 A.D., in China. Printing from movable type began in China in 1041–49. In Europe the printing of books from engraved wood blocks probably dates from the late Middle Ages. The independent discovery in Europe, about 1440, of printing by movable type, made it possible to produce books more easily and cheaply, and resulted in their wider dissemination. The first great book printed by movable type was the *Gutenberg Bible* in 1456.

The writing and printing of books was especially marked during the Renaissance, and was immensely stimulated by the enlargement of the horizon of European thought and interests as a result of the epoch-making discoveries and explorations of new lands, and of the growth of science.

The development and improvement of metal printing presses, from the end of the 18th and the beginning of the 19th centuries, and the later development of high-speed presses and the mechanical setting of type, made possible the production of books on the vast scale and for the relatively low prices attained in the 20th century (see BOOK TRADE).

The following are the principal structural elements of a modern book, in the order in which the reader encounters them: the cover or binding which bears the imprinted title,

author's name, and publisher's name; title page; preface or introduction; table of contents and list of illustrations; text or body of the book; explanatory notes; bibliography; and index. In some books the table of contents (and list of illustrations) precedes the preface; not all books contain explanatory notes, a bibliography, and an index.

Books are published in an almost infinite variety of sizes. In the United States, cataloguers generally state the width and height of the pages, but they occasionally also use designations widely used in Europe; folio, quarto, octavo, duodecimo, 16mo, 24mo, and 32mo. These designations signify the number of leaves (each side of a leaf counting as one page) formed by folding a sheet of book paper. Thus a sheet folded once forms 2 leaves (4 pages), and a book made of sheets so folded is called a folio; a sheet folded twice forms 4 leaves (8 pages), and a book made of sheets so folded is a quarto. See BOOKBINDING; BIBLIOGRAPHY; BIBLIOMANIA; and LIBRARY.

BOOKBINDING. The history of bookbinding is chiefly the history of the ornamentation of book covers. Before the invention of printing, it was done largely by monks, who prepared the books for further embellishment by goldsmiths and jewelers.

Strips of vellum were replaced by cords at the back of the book during the 12th century in England. The taste for artistic bookbinding soon spread to the court of France. Louis XII and his queen both possessed fine examples of bindings, probably Italian. Henry II and his wife Catherine de Médici were perhaps the most enthusiastic royal patrons of the art, and the king's favorite, Diana of Poitiers, had one of the finest collections of bound books ever assembled up to that time.

According to tradition, oak boards were first abandoned in favor of paper by the workmen who covered the books of the famous printer Aldus of Venice in the 16th century. Previous to this time even small books had stiff covers a quarter of an inch thick.

In the 17th century the use of coats of arms fully displayed in gold, and occasionally in all the colors of the different bearings, became the most common adornment.

Metal mountings of all sorts provided dignity and sumptuousness. When books were very heavy and very precious, clasps and bosses, four or five on each side, kept the leather and its ornamentation from being rubbed.

In modern times, the binding of books has shown a general tendency toward simplicity and durability, cloth and half-leather bindings being the most popular. The few exceptions are costly reference works and special editions of the classics. In England there has been a slight tendency to revive the almost lost art of elaborate design, but in America the work of binding runs more often toward an individual and suggestive art, including symbols and figures.

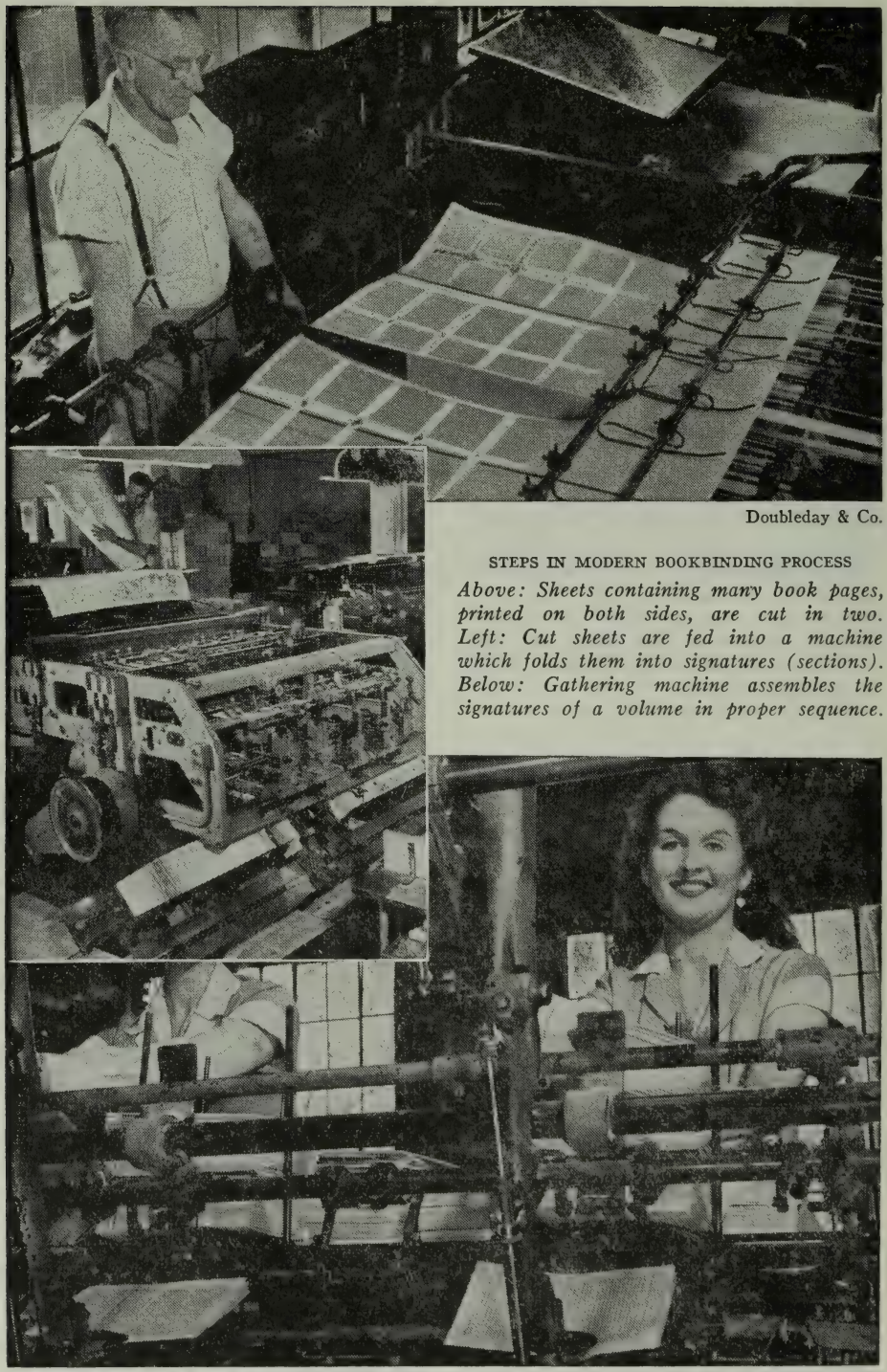
BOOK COLLECTING. See BIBLIOMANIA.

BOOKKEEPING, the practice of systematically recording business transactions to make available in convenient form the essential details of a transaction, the position of an individual account, and the over-all position of a business with respect to its assets and liabilities, credit position, net worth, and profit and loss. Bookkeeping records are kept in columnar form and arranged and balanced according to the basic principle that assets minus liabilities equal net worth. All other bookkeeping functions are subsidiary.

The principal books employed in bookkeeping are the *ledger* and the *journal*. In the ledger, entries are posted and classified in *accounts*, in alphabetical order, from the journal and other books of first (or original) entry. Entries are made in the journal in chronological order, according to the nature of the transaction involved. The ledger and journal are used differently in *single-entry* and *double-entry* systems of bookkeeping.

Single Entry. This is a simple system in which the ledger is posted from the journal (also called the *daybook*) to show only amounts due from customers and owed to creditors, and, usually, the original investment made by the owner of the business, and his withdrawals. This system does not therefore give a complete picture of the business using it. For more detailed information, when desired, it is customary also to keep *sales, cash,* and *purchase books,* the names of which indicate the nature of the entries posted in them. In *single-entry* bookkeeping there is no automatic check on the accuracy of entries and consequently on statements of profit and loss and of assets and liabilities. *Single-entry* bookkeeping suffices for small retail and other enterprises, for some professional occupations, and for institutions—in all of which transactions with individuals are the rule, and the receipt and disbursement of cash is the principal form of settling accounts.

Double Entry. Most businesses and all large-scale enterprises use the *double-entry* system, which differs from the *single-entry* system by providing a complete record of



Doubleday & Co.

STEPS IN MODERN BOOKBINDING PROCESS

Above: Sheets containing many book pages, printed on both sides, are cut in two. Left: Cut sheets are fed into a machine which folds them into signatures (sections). Below: Gathering machine assembles the signatures of a volume in proper sequence.

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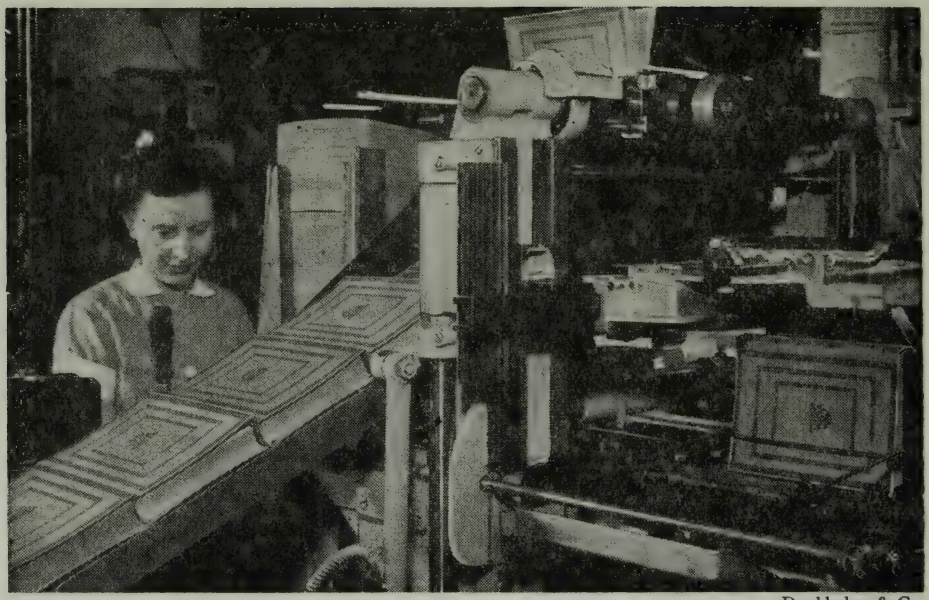
Above: After completion of the gathering process, the signatures of a volume are fed into the sewing machine one at a time, and the whole volume sewed together.

Below: Rounding and lining-up machine. Here backs of the books are rounded to provide rigidity, and cloth and paper linings are glued to the back edges.



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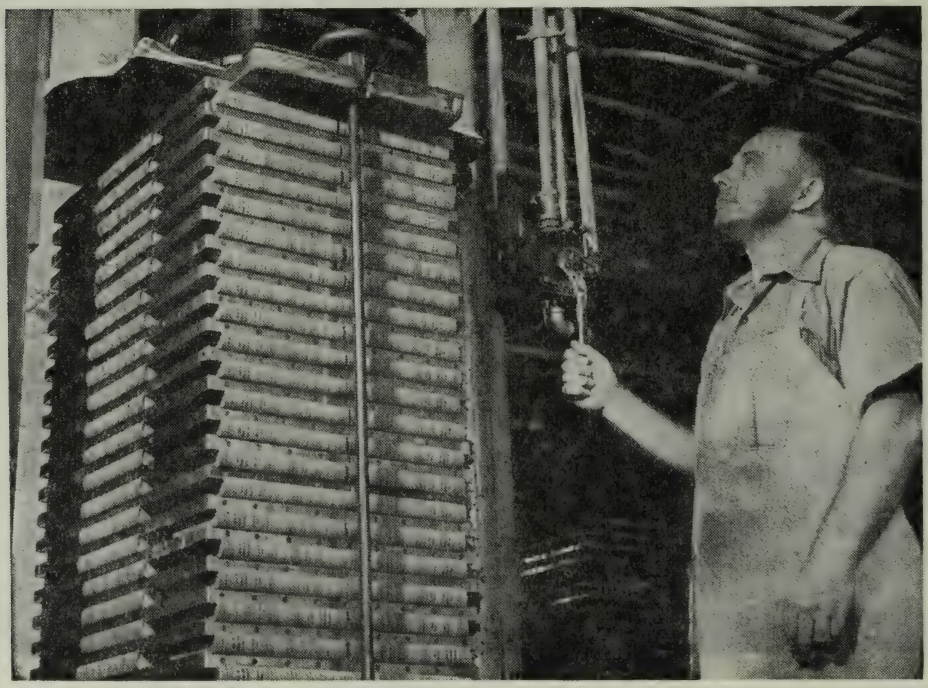
Above: The casing-in machine, where the covers are placed on the books and glued to the linings. Books are coming out of the machine on ramp in front of operator.
Below: Building-in press. Flanged boards put grooves in cover joints as air pressure is applied. Books remain in press, which is locked by vertical rods, until glue dries.



every transaction posted on the books of a business. *Double-entry* bookkeeping is so called because it is based on the idea that each transaction has a double aspect, that of a *debit* (an increase of assets directly through the receipt of payment, or indirectly through a decrease in liability) and of a *credit* (a decrease of assets, an increase of liability, or an increase of net worth). It follows that if each transaction is accurately entered on the books with respect to its debit and credit aspects, the books must always balance, thus providing an automatic check on the accuracy of the bookkeeping.

For the purposes of *double-entry* bookkeeping, *real accounts,* comprising cash, accounts receivable, fixtures, machinery, inventory, and other items, are distinguished from *nominal accounts,* which include overhead, salaries, and other categories of expenses. This distinction is both convenient and necessary for obtaining an accurate and comprehensive statement of assets and liabilities and of profit and loss which, as has been said, is impossible under the *single-entry* system.

Because of its greater complexity, *double entry* requires the use of books not needed in *single entry.* In *double entry* the *ledger* is called the *general ledger* and is split into the *accounts receivable, accounts payable* and other ledgers. Only the totals of the accounts in the other ledgers are posted in the general ledger in *controlling accounts.* Accounts involving data about the remuneration of executives and other matters which are generally of a confidential nature, are usually kept in ledgers especially provided for that purpose.

The *journal* is split into the *sales, purchase, cash* and other books. A number of books, which are kept only for convenient statistical purposes and from which no entries are made in other books, are called *auxiliary books,* and include the *invoice book, order book, inventory book,* and *check book.*

To open a set of *double-entry* books, the bookkeeper or accountant first enumerates in detail the items which are to constitute his investment, such as cash, real estate, and accounts due, and the debts, if any, which are to be paid out of the business. These two sets of items represent, respectively, resources and liabilities. The difference between them will be the net investment. When this entry is journalized, each of the items which will make up the resources will be debited, and each of the titles entering into the liabilities will be correspondingly credited, and the proprietor's name or stock will be credited for the net investment, or the difference between the sums of the two. When the posting for any period has been completed, the debit and credit sides of the ledger should be equal. To determine whether this is the case or not, the *trial balance* is taken—i.e., all the headings of the ledger, excluding those which are in balance or ruled up, are entered on a suitable sheet, together with the debit and credit footings of each in their proper columns; the two columns are then *footed,* and the resulting amounts should be equal. The proving of the trial balance does not indicate, however, that no mistakes have been made, for the trial balance will not discover such mistakes as errors of computation, omission of transactions, or posting to wrong accounts. The *balance sheet,* which is to be distinguished from the trial balance, involves a classification and analysis of accounts in such a way as to exhibit in detail the resources, liabilities, losses, gains, net gain or loss, and present capital of the business. It involves the taking of an inventory of all the property on hand at a given time.

When accounts balance, when they become crowded for space, or when they show a loss or gain at the time of making a balance sheet, they are ruled up or closed. Aside from the purpose of eliminating from an account the element of loss or gain, or of preventing crowding, an account is closed in order to condense it into a single item, thus simplifying and making intelligible at a glance all the information which the account can give.

Because modern business enterprises, especially large ones, involve complicated financial problems, intricate tax problems, and problems arising from governmental regulation of business practices, bookkeeping is almost universally practiced under the supervision of accountants, accounting staffs, or accounting firms, who make periodic audits of the books (see ACCOUNTING).

History. The origin of bookkeeping is unknown. Archeologists have found Babylonian business records engraved on clay tablets, dating from about 2600 B.C., and ancient Egyptian papyri containing business accounts. But these antedate the general use of money and consequently are not included in a definition of bookkeeping. *Single-entry* bookkeeping probably was developed in connection with the use of money in trade. *Double-entry* bookkeeping probably dates from the 13th century A.D. Its development is attributed to the Genoese, Florentine, and Venetian merchants of the 14th and 15th centuries. The first

printed treatise on *double-entry* was the work of a noted Renaissance mathematician, the Franciscan friar Luca Pacioli (1445?–1520?). The treatise, *Particularis de Computis et Scripturis,* is *Tractatus XI* of Pacioli's masterwork, *Summa de Arithmetica, Geometria, Proportioni et Proportionalità,* published in Venice in 1494 (rev. ed., 1525). Principles of the *double-entry* system laid down by Pacioli have remained substantially unchanged.

Outstanding developments in bookkeeping in recent years have consisted in simplifying methods of posting and of tabulation. These developments include refinements in the arrangement in the various books; the use of loose-leaf books; the use of "books" composed of cards which are filed after being posted; and the use of machines which perform bookkeeping functions.

BOOKMAKER. See GAMBLING, in law.

BOOK OF COMMON PRAYER, common name of the *Book of Common Prayer and Administration of the Sacraments and Other Rites and Ceremonies of the Church,* the official prayer book of the Church of England, of Anglican churches of other countries, and of the Protestant Episcopal Church of the United States. The first complete version of the *Book of Common Prayer* appeared during the Reformation, in 1549, in the reign of Edward VI, and its use was made compulsory by Parliament. It followed other church reforms and was the result of the work begun in the reign of Henry VIII, under the direction of Thomas Cranmer and Nicholas Ridley, to produce in the vernacular a book which would be a unified and simplified equivalent of the Roman Catholic Liturgical Books—*Breviary, Missal, Pontifical,* and *Manual*—which were written in Latin. Cranmer and Ridley excluded from the *Book of Common Prayer* all matter in the Roman Catholic Liturgical Books which they considered "superstitious and ungodly". An ordination service was added in 1550.

A revised version of the *Book of Common Prayer,* sometimes called the Second Prayer Book of Edward VI, appeared in 1552, and its use, too, was made compulsory by Parliament. This version differed radically from the earlier one, chiefly in excluding from the church service all ritual for which there was no warrant in the Scriptures, and in further changing the service to make it unlike the service prevailing before the Reformation. Eight months after its appearance, it was suppressed by Queen Mary I, who reintroduced Latin services in the Church of England.

After Queen Elizabeth ascended the throne in 1558, the *Book of Common Prayer,* amended in a Catholic direction, was restored to use; further amendments in the same direction were made in 1604, in the reign of James I. During the Commonwealth (q.v.) the *Book of Common Prayer* was suppressed, but in 1662, following the restoration of the monarchy, its use was again made compulsory. Amendments made in the 1662 version were also in a Catholic direction and resulted in the defection from the established church of many Puritans. Only minor amendments were made in the *Book of Common Prayer* after 1662. A movement for revision, which began in 1910 in various parts of the English-speaking world, resulted in a decision (in 1928) by the Protestant Episcopal Church of the United States to undertake the preparation of a modernized version of the *Book of Common Prayer.*

BOOK OF MORMON. See MORMONS.

BOOK OF THE DEAD or ***EGYPTIAN BOOK OF THE DEAD*** (known to the ancient Egyptians as *The Book of Coming Forth by Day*), the name given to the collection of magical formulas, hymns, and prayers believed by the ancient Egyptians to form a guide and protection for the soul (*Ka*) in its journey into the region of the dead (*Anenti*). Knowledge of these formulas, hymns, and prayers, the Egyptians believed, enabled the soul to ward off demons attempting to impede its progress, and to pass the tests set by the 42 judges in the hall of Osiris (q.v.), god of the underworld. The soul passing these tests was allowed to mingle with the gods. The soul failing these tests was devoured by a monster which was part hippopotamus, part crocodile, and part lion. The texts of the *Book of the Dead* also indicated the belief of the ancient Egyptians that happiness in the afterlife was dependent on the deceased having led a virtuous life on earth. Part of the *Book of the Dead* is believed to have originated in the predynastic period of Egyptian history. In the Fifth and Sixth Dynasties the *Book of the Dead* was inscribed on the sarcophagi in the pyramids of the kings. By the time of the Eighteenth Dynasty it was inscribed on papyri, which were frequently from 50 to 100 feet in length, and were often illustrated with drawings or colored pictures. These papyri were placed in or near the coffins of the dead. See also EGYPTIAN LANGUAGE AND LITERATURE.

BOOKPLATES, labels of ownership, generally engraved or printed, placed on the inside covers of books, and sometimes known as

ex-libris (Lat., "from the books of") from the use of those words preceding the owner's name. Bookplates were first used about the middle of the 15th century. Among the best-known early examples are those designed and engraved about the beginning of the 16th century by the German artist Albrecht Dürer. Engraved English bookplates date from the second half of the 16th century. The early designs, beginning with Dürer's, contain representations of the heraldic coats of arms of their owners, and are usually described as "armorial". In the 18th century new motifs were introduced, notably landscape drawings and portraits, references to classical allegory, and symbolic representations of the occupations or pursuits of the book's owner. Abstract ornamentation also was used, especially in the 19th and 20th centuries. In recent times a number of newer mediums, such as colored etchings, lithographs, and photographs, have been used in bookplate design.

BOOK SCORPION, any insect of the order Pseudoscorpionida, closely related to the true scorpions (q.v.). In appearance it is like a small, flattened scorpion without a tail. The front of the body bears a transverse dorsal groove; the posterior is flat, with 10 or 11 rings. There are two eyes; the respiration is by means of air tubes; the eggs are carried about on the abdomen of the female. Spinning glands are present, and the body is sometimes covered by the secretion. The size is about one-half inch, the color brownish. The book scorpion lurks among old books and papers, and probably helps their preservation by killing off and eating book lice, mites, and other small insects.

BOOK TRADE. The trade in books is very old. Those scholars who consider the graven clay and stone tablets and polygonal cylinders of the ancients the oldest books, place the origin of the book trade in the times of the ancient Assyrian, Babylonian, and other kingdoms. Those authorities who regard the papyri scrolls of antiquity as the first books, assign the beginning of the buying and selling of books to a period several thousand years B.C. Scribes made copies on papyrus of the compositions of poets and orators, and sold them for high prices to wealthy purchasers. Such a scribe was Baruch, as recounted in the Old Testament in *The Book of the Prophet Jeremiah*. Aristotle was said to have possessed a large library of such books.

It is probable that the first regular sales of literary work in Athens were carried on by students of philosophy. The facilities for the work of scribes in Athens were evidently inadequate to supply the demand of the scholars. Books continued to be very costly, and their ownership was limited to the wealthy By the time of Xenophon (about 400 B.C.) Athens was the center not only of the literary activities of Greece, but of any book trade that existed. The first booksellers prepared with their own labor the scrolls, mainly papyrus, that constituted their stock in trade. The next step in the development of the business was the introduction of the entrepreneur, who employed a staff of copyists and sold the products of their labor. The Athenian booksellers derived receipts not only from the sale or from the hire of manuscripts, but from the reading of these aloud in their shops to hearers who paid for the privilege. After the conquest of Greece by the Romans there was a revival in Athens of the trade in books, owing to the increased demand from the scholars of Rome.

About 250 B.C., under Ptolemy Philadelphus, Alexandria, Egypt, became one of the great book marts of the world. Its first publishing and bookselling were done in connection with the great museum founded by Ptolemy. This comprised a lending and reference library, a series of art collections, a group of colleges endowed for research, a university for instruction, an academy, and workrooms where the scribes prepared from authenticated texts the papyrus manuscripts to be distributed throughout the civilized world. Through their enterprise in training numbers of skilled scribes, and by means of the distributing facilities afforded by the commercial connections of their capital, the Alexandrian publishers retained in their hands for more than two centuries the control of the greater part of the book production of the world.

In Rome the first publishers were men who combined with literary tastes sufficient means to pay for the production of the editions, because the educated slaves who served as scribes were paid high prices for their work. By the close of the first century A.D. the book trade in Rome and in other larger cities of the Empire had developed large proportions. Vessels from Alexandria brought into Rome great cargoes of papyrus from Egypt, which speedily found their way into the workrooms of the publishers. In the bookshops (*taberna librarii*), collections of the accepted classics and of the latest literary novelties were attractively presented. From the Roman shops large shipments of books were made to other cities, even as far as Gaul. The average edi-

tions of works addressed to the general public are estimated to have comprised from 300 to 1000 copies.

By the time of the accession of Constantine (306 A.D.) the Roman book trade had very much decreased, and with the removal (in 328) of the capital to Byzantium the activities of Rome in connection with general literature practically ceased.

Itinerant booksellers were characteristic figures in medieval Europe, but in the early Middle Ages, bookmaking was largely a monopoly of the *scriptoria* of the monasteries. For some centuries the books written in the monasteries were produced for the use only of the monks or of the pupils under their charge. Later there came into vogue the practice of exchanging manuscripts between monasteries, which developed in a measure into a trade in books. For centuries the knowledge of reading and writing was so far confined to the clerics that there was no demand for such manuscripts outside of the monasteries. Later, under the influence of certain princes who owed their early education to monastery schools, the fashion arose of collecting, in the libraries of kings and nobles, manuscripts containing specimens of the world's literature.

In the later Middle Ages bookselling was stimulated by the rise of universities, particularly those established in Paris (1150) and Bologna (1200). The universities supervised the preparation of textbooks and literary works which were sold on commission by university officials. The book dealers of Paris, for centuries, constituted a guild organized within the University of Paris.

In England, at Oxford and Cambridge universities, the *stacyoneres* (booksellers) began their work some years later than in Paris or Bologna. They had, however, the advantage of freedom from the greater portion of the restrictions which hampered the work of the French and Italian scribes, and their business developed so actively that they soon became the booksellers of the university towns and in large part of the scholarly public of the whole country. It was, of course, from the university use of the term that the name "stationers" came at the outset to be applied to the organized book dealers of Great Britain. The first guild of the British book dealers (the forerunner of the Stationers' Company of 1556) completed its organization in 1403, nearly 60 years before the introduction into England of the printing press.

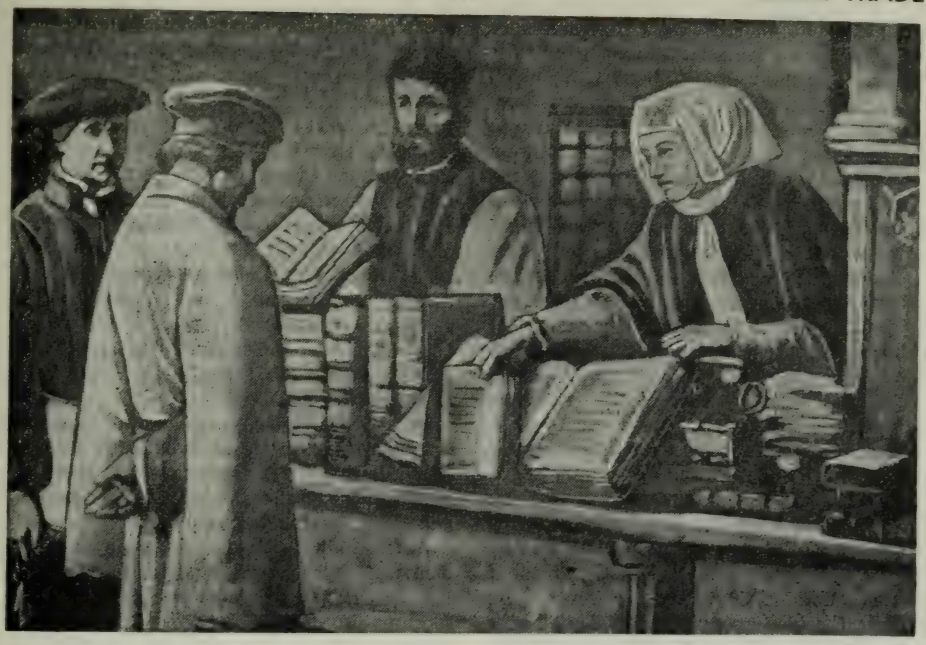
The Modern Book Trade. To the period following the invention in Europe, about 1440, of printing by movable type, is generally assigned the origin of modern practices and methods of bookselling. The first printers often themselves edited the works they produced and sold them directly to purchasers, employing agents at universities to sell their books. Antony Koburger, the first printer to establish a business in Nuremberg (1470), had 16 shops, and book agents in every city in the Christian world. Johann Fust (one-time partner of Johann Gutenberg) and Peter Schöffer, German printers, were able to offer the books they printed at prices far below those charged for manuscripts.

The greatest publisher of this period, however, taking into account the influence of his business upon the literature and upon the civilization of his time, was Aldus Manutius (1450–1515) of Venice. It was to the high scholarly ideals and courageous and unselfish labors of Aldus and his immediate successors, no less than to the imagination, ingenuity, and persistency of Gutenberg and Fust, that the Europe of 1495 was indebted for the great gift of the poetry and of the philosophy of Greece. In the organization of his printing and publishing business Aldus had special obstacles to overcome, such as the difficulty of training Italian compositors to set Greek texts, and the delivery of books from Venice to different points of the Continent.

Other outstanding publisher-booksellers of this period included William Caxton, who set up a printing business in Westminster, England, in 1476, and was the first to introduce printed English books to English readers; Johann Froben who, in 1491, in Basel, Switzerland, founded a publishing establishment which became noted for the artistic taste and scrupulous accuracy of the books it produced; and Henri Estienne who, in 1502, in Paris (where printed books were sold as early as 1458), established a printing business which was carried on after his death by four generations of his descendants and contributed greatly to the production of scholarly works.

A publishing business which, while of no great moment from the commercial point of view, exercised an enormous influence on public opinion in Europe was that instituted in the Saxon town of Wittenberg in 1517, at the instance of Luther and Melanchthon. The pamphlets that went out from this press, reprinted in other places by printers who were in sympathy with Luther's work, secured an enormous circulation.

About 1536–37 Spaniards began the publication of books in the New World in Mexico



In a Belgian bookshop of the Renaissance period (from painting by Baron Hendrik Leys)

City. For a time during the 16th-17th centuries, the principal bookselling centers were a number of cities in the Low Countries. One of the most noteworthy of the printing houses of the 16th century was that established in 1555 by Christopher Plantin in Antwerp. His publications were distinguished not only for the perfection of their typography, but for the beauty of the illustrations, chiefly produced by engraving on copper plates. The publishing business founded by him continued in the hands of his descendants until 1867 and had thus a continuous existence of nearly three centuries.

The Elzevirs of Leyden and Amsterdam, whose work continued during the century between 1587 and 1688, were the most noteworthy publishers of Holland, and the repute of the books issued from the Elzevir Press has continued to the present day. While the fame of Plantin had rested chiefly on his illustrated volumes, the reputation of the Elzevirs was connected more particularly with the classical publications produced by their press.

A number of 18th-century booksellers established reputations for literary as well as business ability. Charles Rivington (1688–1742) founded the famous house to which he left his name, and gave it the somewhat theological character which it long retained. Thomas Longman (1699–1755) founded another business, which, like that of the Elzevirs and the Estiennes, was continued from generation to generation; and a third dynasty was begun by John Murray. The great university presses, the Clarendon at Oxford, and the Pitt at Cambridge, have published a vast number of books, largely classical texts, in a uniformly scholarly manner.

The Book Trade in the United States. The beginning of printing in the English colonies in America dates from 1639, when Stephen Day printed the *Freeman's Oath* and an *Almanack* at Cambridge, Mass. The following year appeared the famous *Bay Psalm Book*, which sold in 1947 for $151,000. Day's press turned out one book a year for the next 21 years. Apart from these origins, the history of publishing and bookselling in America may be divided into four periods: (*a*) the Colonial period; (*b*) from the Revolution to 1820; (*c*) from 1820 to 1860; (*d*) from 1860 to the present time. The selling of books, mostly imported, was at first usually combined with that of other wares; thus Benedict Arnold sold books and drugs. The second period was the real beginning of the American publishing business in any modern sense. The first book-trade organization was effected through the efforts of Matthew Carey. The principal object

was to introduce annual gatherings similar to the book fairs of Leipzig, Germany, the most important of the European book fairs, which was first organized in the 15th century. Several such meetings were held, the last one in Elizabethport, N.J. These book fairs were succeeded by the "trade sale", held twice a year, first in Philadelphia and later in New York. The heads of publishing houses themselves stood on the platform and sold their books only to members of the trade. The system decayed when people who were not legitimate booksellers gained admission and indulged in reckless underselling and speculation.

During the first quarter of the 19th century the greater part of the business done in the United States consisted in the importation of English books; and up to the close of the Civil War, probably more than half the titles listed in American catalogues were the works of English authors, reprinted usually (in spite of honorable exceptions) without compensation. This period, however, was really the golden age of American publishing and witnessed the foundation of a number of famous publishing houses. The following dates may be given for the foundation of some of the more famous: Methodist Book Concern, 1789; Harper & Brothers, 1817; D. Appleton & Co., 1825; John Wiley & Sons, 1828; J. B. Lippincott & Co., 1792; G. P. Putnam's Sons, 1836; Little, Brown & Co., 1837; Dodd, Mead & Co., 1839; Charles Scribner's Sons, 1846; Houghton, Mifflin Co., 1849.

Improvements in the technical phases of bookmaking, and the extensive development of transportation facilities and selling methods gave a great impetus to the book trade in the United States after 1860. After this date a gradual specialization took place in the book trade almost everywhere. Publishing became separated in large part from bookselling, which eventually became largely the province of wholesale dealers and individual or corporate retailers. The year 1900 witnessed the organization of the American Publishers Association (later the Book Publishers Bureau) and the American Booksellers Association; and in subsequent years local organizations of booksellers were formed in a number of leading cities.

In 1921 the Literary Guild was incorporated, and in the following year the Book-of-the-Month Club issued the first of its monthly book selections. These organizations differed from the book clubs of earlier years in that they were established as commercial distributors, selling books by mail on an annual subscription basis, and on a national scale. They also differed from the earlier book clubs organized in Germany after World War I, in that, unlike their German prototypes, they were not publishers. In later years, however, a number of book clubs were established by publishing firms as outlets for the books of those firms. In a recent year there were more than 25 book clubs, including the Literary Guild (1,250,000 members), Book-of-the-Month Club (925,000), Dollar Book Club (700,000), Peoples Book Club (280,000), and the Book League (200,000).

Other book clubs, especially those specializing in a single type of publication such as classical literature, historical or scientific works, religious subjects, or detective fiction, had smaller memberships.

Among other important recent developments in bookmaking and bookselling are the "pocket books", low-priced, small-sized reprints, in hard paper covers, usually of classics, best-selling novels, and detective and adventure stories. "Pocket books" are particularly well adapted for sale by small retail establishments and variety stores, and millions of copies are sold annually.

The following figures indicate the magnitude of the U.S. book trade: About 8000 new titles are published annually in scores of millions of copies; more than 10,000,000 copies of the Bible are sold annually.

In a recent year there were more than 800 publishers, several hundred wholesale bookselling establishments, and about 3000 retail bookstores. The amount of money spent for books in the United States, in a recent year, was about $306,380,000.

New York City is the largest publishing and bookselling center in the United States. Other large centers are Boston, Chicago, Philadelphia, Cincinnati, San Francisco, and Cleveland.

BOOKWORM, any insect which feeds on the paper or binding of books. The name is most frequently given to the larvae of beetles of the superfamily Bostrichoidea, although any insect which normally feeds on starchy material or wood may eat paper. The larvae of the Bostrichoidea are from 1/10 to 1/5 inch long when fully grown. A larva of one species, *Ptinus fur,* has been known to bore a straight hole through 27 thick quarto volumes. Others, of the genus *Sitrodrepa,* are known as "drugstore beetles"; in addition to eating paper

they thrive on such extraordinary foods as squill, belladonna, and red pepper. A bookworm of the genus *Anobium* makes some of the "wormholes" in wood, and the ticking noise which it makes in its burrow has given rise to the name, "deathwatch beetle", applied to it.

Insects other than beetles, such as cockroaches and the tiny larvae of moths of the family Oecophoridae, have also been known to destroy books.

See also Book Scorpion.

BOOLE, George (1815–64), English mathematician and logician, born in Lincoln, and largely self-educated. In 1849 he was appointed professor of mathematics at Queen's College in Cork, Ireland. He is noted for the development of the algebraic system, known as Boolian algebra, in which logical propositions are denoted by symbols and subjected to abstract mathematical operations, corresponding to the laws of logic (q.v.). Among his works are *Investigation of the Laws of Thought* (1854), *Treatise on Differential Equations* (1859), and *Treatise on the Calculus of Finite Differences* (1860).

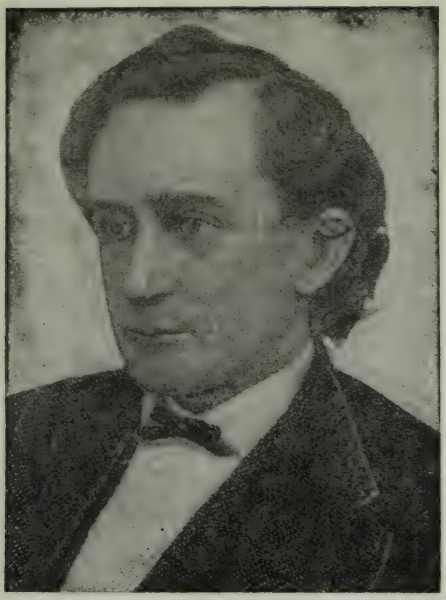
BOOMERANG, weapon and missile used chiefly by the Australian aborigines. Made of hard wood, it is roughly V-shaped, with arms slightly skewed, and the angle between the arms ranging from 90° to about 160°. Both edges are sharpened; one surface is flat, and the other slightly convex. The *return* boomerang, which normally returns to the thrower, is 6 to 24 inches in length, and is used for sport and for hunting small birds. Held vertically in the right hand, it is thrown spinning, on a line parallel to the ground. For 90 or more feet the missile flies at the same level; then it inclines to its flat side, rises, and curves to the left, and, still curving, glides back to the thrower. Throws of over 300 feet have been made with this type of boomerang. The *nonreturn* boomerang, straighter, heavier, and ranging in length from 3 feet upward, is used in war and for hunting large game. With it the Australian aborigines can fatally injure an enemy or bring down game at a distance of 500 feet. The nonreturn boomerang, ordinarily thrown in the same fashion as the return type, also returns if skillfully thrown at an angle of 45° to the ground. In such cases, however, it will not travel as far as when it is thrown in the usual way.

Missiles similar to the boomerang are used by various native tribes of northeastern Africa, by the Hopi Indians of Arizona, and by certain primitive peoples of southern India.

Daniel Boone

BOOMSLANG (Dutch, "tree snake"), a South African, arboreal snake, *Dispholidus typus,* similar in size and shape to the common American blacksnake. It is in the same family, Colubridae (q.v.), as many common harmless snakes, but belongs to a group, Opisthoglypha, characterized by grooved poisonous fangs in the rear of the mouth. These fangs are used for subduing the prey, consisting of rodents and reptiles, but are rarely used in defense; for this reason snakes of this group are not generally rated as dangerous to men, although if a boomslang should inflict a bite, it might prove fatal.

BOONE, county seat of Boone Co., Iowa, 43 miles N.W. of Des Moines. It is serviced by three railroads, and is an important center for grain and livestock. In the surrounding region are also deposits of bituminous coal, gravel, and clays. The principal industries in the city include the manufacture of refrigerators, small concrete-block machines, prefabricated buildings, and hog waterers. Boone was incorporated as a city in 1868, and named for Col. Nathan Boone, son of Daniel Boone.



Edwin Booth, American actor

It is the site of Boone Biblical College and Boone Junior College. The Ledges State Park, one of the finest in Iowa, is located 5 miles s. of the city. Pop. (1950) 12,164.

BOONE, DANIEL (1734–1820), American pioneer, born near the site of present-day Reading, Pa. In 1753 his family settled at Holman's Ford, on the Yadkin River, N.C., and in this primitive settlement Boone received some schooling and became a skillful hunter and trapper. He served with the forces led by the British general Edward Braddock in the campaign (1755) against Fort Duquesne during the French and Indian War. Subsequently Boone developed an ambition to explore and settle the wilderness around the Kentucky River, and in 1767 he made the first of many trips into the region. On his most important expedition (1769–1771) he explored eastern Kentucky. He began the trip with five companions. The entire party was captured by Indians in December, 1769, but Boone escaped. Joined by his brother, who had set out to find him, he built a cabin near the site on which Boonesboro (Ky.) was later established, and the two men lived in the wilderness during part of the winter of 1769–70. Boone attempted to lead settlers into the region in 1773, but was forced to turn back by persistent Indian attacks. In 1775, having been engaged as the agent of a Carolina trading company to purchase land in Kentucky, he built a stockade and fort on the site of Boonesboro. During the American Revolution the community suffered repeated Indian attacks instigated by the British, and in 1778 Boone was again held captive for a time by Indian raiders, but the settlement was eventually established as a permanent village.

During the early 1780's, Boone was forced to abandon his claims to the land around Boonesboro because of invalid titles. He left the region, and from 1788 to 1798 lived near Point Pleasant, Va. (now W.Va.). About 1799 he settled on land near St. Louis, in present-day Missouri, and remained there until his death. The region was then under the authority of Spain; in 1803 it became United States territory as part of the Louisiana Purchase, and in 1814 Boone's claim to the land he occupied was confirmed by the U.S. Congress in recognition of his services as explorer and settler. After his death Boone came to be regarded by the American people as a model of the typical pioneer, characterized by such traits as personal courage, an urge to extend the limits of the frontier, and great skill in woodcraft and marksmanship. He was elected to the Hall of Fame for Great Americans in 1915.

BOONVILLE, county seat of Cooper Co., Mo., situated on the Missouri R., about 25 miles w. of Columbia. It is served by two railways and is an important river port, with a large trade in agricultural products. Industries include flour milling and the manufacture of shoes, carbonated beverages, cement blocks, and silos. At Boonville, on June 17, 1861, a Union force of 2000 men, under General Nathaniel Lyon, defeated a larger force of Confederate volunteers, commanded by General John S. Marmaduke. The battle was the first land action of the Civil War. Founded in 1818, Boonville was incorporated as a town in 1839 and as a city in 1896. Pop. (1950) 6686.

BOOT. See BOOTS AND SHOES.

BOÖTES, in astronomy, a northern constellation situated between Corona Borealis and Cannes Venatici. It is kite-shaped in outline, and its brightest star is Arcturus.

BOOTH, BALLINGTON (1859–1940), Anglo-American reformer born at Brighouse, Yorkshire, England. He was the second son of William Booth (q.v.), founder and general of the Salvation Army. Ballington Booth was commander of the Salvation Army in Australia (1885–87) and in the United States (1887–96). He left the organization as the result of a dispute with his father on methods

of operation. In 1896 he founded the Volunteers of America (q.v.), becoming the general in chief and president of the organization.

BOOTH, Charles (1840–1916), English statistician, and writer, born in Liverpool. He is chiefly known for his report, *The Life and Labour of the People of London* (10 vols., 1889–1903), designed primarily to show "a numerical relation which poverty, misery, and depravity bear to regular earnings and comparative comfort". Booth also wrote *The Aged Poor in England and Wales* (1894) and works on old-age pensions (1891, 1899). In 1904 he became a member of the commission on tariff reform. He was president of the Royal Statistical Society from 1892 to 1894.

BOOTH, Edwin Thomas (1833–93), American actor, son of the Anglo-American actor Junius Brutus Booth, born in Belair, Md. He made his stage debut in Boston, Mass., in 1849, playing a minor role in *Richard III* by William Shakespeare. He toured California with his father in 1852, and subsequently appeared in the West and in Australia until 1856. In 1861 Booth made his debut in England, and from 1862 to 1873 he was one of the leading figures on the New York stage. During the latter period he gave his first performance in the title role of *Hamlet* by William Shakespeare, one of his best-known interpretations, and successively managed the Winter Garden Theater (1863–65) and Booth's Theater (1869–73). His career at the Winter Garden was ended by public protests in 1865, when his brother John Wilkes Booth assassinated President Abraham Lincoln, and his heavy investment in the Booth's Theater enterprise was wiped out during a financial depression in 1873. Between 1873 and 1879 he toured the United States and made good his losses. In 1880 and again in 1882 he appeared in England, where he alternated in repertory performances with the English actor Sir Henry Irving, and from 1887 to 1891 he was associated with the American actor Lawrence Barrett in repertory performances in New York City. After Barrett's death in 1891, Booth retired from the stage. He is generally considered one of the finest tragic actors in the history of the American stage. Among Booth's interpretations, besides those mentioned above, were those of the Shakespearean roles of Romeo, King Lear, Othello, Iago, Benedict, and Brutus.

BOOTH, Evangeline Cory (1865–1950), general of the Salvation Army (q.v.) and daughter of William Booth (q.v.), born in England, and educated in London. She supervised Salvation Army field operations successively in Great Britain, Canada, and the Klondike. In 1904 she was promoted to the command of the Salvation Army in the United States. She directed Salvation Army war work during World War I, and was the recipient of the D.S.M. from the U.S. government in 1919. Elected general of the World Wide Salvation Army in 1934, she held this position until 1939, when she retired. She wrote the words and music of many well-known Salvation Army songs, and *Songs of the Evangel* (1927). Her prose writings include *The War Romance of the Salvation Army* (with Grace Livingston Hill, 1919), *Towards a Better World* (1928), a collection of sermons, and *Woman* (1930), a pamphlet on the problems of women in modern society.

BOOTH, John Wilkes (1838–65), American actor, born in Harford Co., Md. He was a son of Junius Brutus Booth and brother of Edwin Thomas Booth (qq.v.). From 1860 to 1863 John Booth was a successful actor of Shakespearean roles. He was a violent partisan of the cause of the South in the Civil War, and in 1864 organized a conspiracy to abduct President Abraham Lincoln and subsequently to kill the President, the vice-president, and the members of the cabinet. On the night of April 14, 1865, while Lincoln was sitting in a box at Ford's Theater, Washington, D.C., Booth shot him through the head. The President died the next day. Booth escaped from the theater, but was overtaken 12 days later in a barn near Bowling Green, Va., and was shot there or committed suicide. See Surratt, Mary E.

BOOTH, Junius Brutus (1796–1852), Anglo-American actor, born in London. He was descended through his mother from the English statesman John Wilkes, and was the father of the actors Edwin and John Wilkes Booth. He engaged in printing, painting, sculpture, and law, and served in the navy as a midshipman, before making his theatrical debut in 1813. At Covent Garden Theatre, in London, at which he appeared from 1817 to 1820, he established his reputation as an interpreter of tragic roles. Booth emigrated to the United States in 1821, and made his first appearance in this country in Petersburg, Va. He subsequently became one of the leading actors of the American stage. In 1824 he established a permanent home in Belair, Md. During the following year and again in 1836 he gave performances in England. He also successfully toured the United States as far west as California. Booth died while en route

by steamboat from New Orleans, La., to Cincinnati, Ohio.

BOOTH, MAUD CHARLESWORTH (1865–1948), American reformer, born at Limpsfield, Surrey, England. She was a leader of the Volunteers of America, and the wife of Ballington Booth (q.v.). The daughter of a clergyman, she early became interested in the work of the Salvation Army, and at the age of 17 left home and became a companion of Catherine Booth in organizing a branch of the Salvation Army in Paris. There she remained two years, then went with a party of Salvationists to Switzerland, where, after suffering vicissitudes and even imprisonment, she succeeded in establishing a Salvation Army corps. In 1896 she withdrew with her husband from the Salvation Army and founded the Volunteers of America (q.v.), of which she became president in 1940. She gave her attention mainly to the Prison League of this organization, doing evangelical work in State and Federal prisons. Mrs. Booth was one of the founders of the Parent-Teachers Association. Her writings include: *Branded* (1897), *After Prison—What?* (1903), *Twilight Fairy Tales* (1906), and *Relentless Current* (1912).

BOOTH, WILLIAM (1829–1912), English religious leader and founder of the Salvation Army (q.v.), born in Nottingham, and educated privately for the Methodist ministry. At the age of twenty-three he began an evangelistic career; subsequently he traveled over most of England as an itinerant preacher. He planned a campaign for carrying the gospel to dwellers in city slums, and submitted it to the Methodist New Connection Church, but it was rejected as too radical. Thereupon Booth separated from orthodoxy, and in 1865 began preaching as an independent evangelist in the East End of London.

In 1878 he organized the Salvation Army, of which he became general, to propagate the Christian faith and to furnish spiritual and material aid to needy persons. Equipped with uniforms and flags, drums and cornets, on their first appearances in the streets its members were greeted with riotous demonstrations, and the Salvationists were frequently arrested for disturbing the peace. The work progressed, however, and under Booth's leadership branches of the Salvation Army were established in all parts of the world, with international headquarters in London.

Booth wrote several books, the best known of which is *In Darkest England and the Way Out* (1890). He also founded the *War Cry,* official organ of the Salvation Army.

BOOTHE, CLARE (1903–), American writer and Congresswoman, born in New York City, and educated at St. Mary's, Garden City, N.Y. She held editorial positions with *Vogue* and *Vanity Fair,* traveled extensively in Europe and Asia, and achieved prominence as a writer on contemporary subjects and as a playwright. In 1935 she married the publisher Henry R. Luce (q.v.). Her outstanding plays are *The Women* (1937), *Kiss the Boys Good-bye* (1938), and *Margin for Error* (1939). In 1940 she wrote *Europe in the Spring,* a commentary on European affairs. She was elected to the House of Representatives from Connecticut in 1942 and again in 1944. In February, 1953, President Dwight David Eisenhower appointed her ambassador to Italy.

BOOTHIA PENINSULA, formerly **BOOTHIA FELIX PENINSULA,** peninsula in Franklin District, Northwest Territories, Canada. Its N. extremity, at lat. 73°54′ N., is the northernmost point of the North American mainland. The peninsula is joined to the mainland by Boothia Isthmus, and is separated on the N. from Somerset Island by Bellot Strait. Discovered by the British explorer Sir John Ross during his voyage of 1829–33, it was named in honor of Sir Felix Booth, who had donated funds for the expedition. Near Cape Adelaide, on the W. coast, the British explorer Sir James Ross, nephew of Sir John, in 1831 discovered the magnetic pole at lat. 70°5′17″ N. and long. 96°46′45″ W.

BOOTHS, FESTIVAL OF. See TABERNACLES, FEAST OF.

BOOTLE, county borough of Lancashire, England, at the mouth of the Mersey R., near Liverpool. It is a shipping center, with numerous docks, and has a variety of industrial establishments, including lumberyards, flour mills, foundries, and tin, dye, and electrical works. Pop. (1951 prelim.) 74,302.

BOOTS AND SHOES. The origin of shoes has been traced to Egypt, where early shoes consisted of interwoven strips of papyrus. From the walls of Thebes has been derived the information that the shoemaker's art was recognized as a distinct art in the days of Thothmes III, about the time when the Israelites began their flight into Egypt. Among the Jews, early shoes were of rush, linen, leather, or wood, and were tied to the feet with thongs.

The first pointed shoes were worn by the Assyrians. In the time of the earliest Assyrian sculptures, foot soldiers—the spearmen and bowmen—sometimes wore a simple flat san-

dal with a protection for the heel, and a cross-lacing of thongs around the big toes, and others over the instep. The sandals worn were of two kinds: one with very thin sole and heel-cap made of leather strips sewn together; the other with a sole of considerable thickness at the heel, tapering gradually toward the toes. In this way heels were first introduced. To the sole was attached an upper that served as a protector for the heel and sides of the foot, leaving the toes and instep exposed. The strips of which the sole of the first type was made were sometimes colored alternately red and blue, but oftener were entirely of reddish tint.

The later Assyrian soldiers, especially the cavalry of the 8th and 7th centuries B.C., wore laced boots or greaves that reached almost to the knees. The later Assyrian kings wore a clumsy foot covering rounded at the toe, and decorated with crescents, rosettes, or other designs. The Assyrian queens of those days wore embroidered shoes not altogether unlike the wear-resisting lounging slippers of the 19th century known as *pantoffles*. The monarchs, when they went lion hunting, wore boots that reached up the leg almost to the knee. The same type of shoe, but of coarser make, was worn also by the king's attendants on hunting trips.

Herodotus and Strabo have described the dress of the Medes, including a high shoe or low boot that opened in front and was fastened with buttons. The Median sovereign wore a long shoe tapering at the toe, buttoning in the front, reaching high over the instep. Its color was saffron or deep yellow.

Among the Greeks the poorer classes wore cheap and simple shoes, the upper classes sandals; there were slippers for the ladies and high laced boots for hunting and traveling, as well as the thick-soled half-boot or "buskin" (*cothurnus*) worn by tragedians. While the Romans often wore sandals or soft shoes for dress, they had a special shoe (*calceus*) with slits at the sides and straps laced in front, of red leather for patricians and black for senators. The soldier's *caliga* was a heavy hob-nailed sandal, with straps wound around the foot and ankle.

During the Middle Ages most shoes had soft uppers, sometimes closed to the ankle or higher, but frequently open down the front, and laced over with decorative straps. Stocking boots, woolen gaiter shoes, and simple leather soles sewed to the feet of tights were also worn. Tops of high shoes and boots were often folded over or trimmed with fur. The English chronicler Matthew Paris states that King Henry II, interred at Fontevraud, was arrayed in the royal vestments and wore boots wrought with gold.

During the 13th and 14th centuries, shoes snouted and piked, crooking upward, were called *cracowes*. The pointed toes were fastened to the knees with chains. Later some points extended to the waist, while others were made to curl out, giving a splayfooted effect. Such extreme fashions, however, soon came under royal regulation; no restriction was placed upon princes of the royal house but the pointed toes of the shoes of other persons of high birth were limited to two feet in length, those of knights to eighteen inches, those of citizens to twelve, and those of plain people to six inches. The Church, however, condemned this extravagance in dress so effectively that the fashion lost popularity.

Edward IV forbade shoes or boots for general wear extending more than two inches beyond the length of the foot. The result was the broadening of the toe, favored by Henry VIII, who suffered from gout and overweight. In due time the width of shoes was restricted to six inches, except for the King.

The high heel of modern times is an introduction of Catherine of Medici. By the 17th century it had reached a height of six inches, and the beauties of the period found it difficult to walk. Louis XIV is said to have introduced it to the men. The so-called French heel was introduced by Charles II.

The *jack boot* was also introduced in the Stuart period; then followed the *Blucher*, *Hessian*, and *Wellington* boots. *Brogans*, common in the Civil War, were stout shoes originally common among the Gaels, and possibly modeled on the *buskin*, the leather boot worn by hunters, horsemen, and actors in classic times. They were worn in the Middle Ages, made of costly materials, by emperors and kings at their coronations.

The *brogan* is a descendant of the *brogue*, a rude shoe of untanned hide, worn in the wilder parts of Ireland. The Irish brogue covered the upper surface of the foot and the entire leg and probably once extended way up the thigh. Thus probably the word, used originally for a shoe or sandal, was extended to mean hose and breech.

In the time of George III, men wore boots with long brown tops and high boots with curved tops and a gold tassel in front. Heels of shoes were low, toes a pointed oval, and latchets and buckles low on the instep. Ladies' shoes about 1760 were on high spindle heels and had large buckles and round toes until

ANCIENT AND EARLY BOOTS AND SHOES. *1, Egyptian sandal; 2, Greek sandal; 3, Roman caliga; 4, Gaulish sandal; 5, 11th century; 6, 13th century; 7, 15th century; 8, 17th century; 9, 17th-century woman's shoe; 10, 19th-century woman's shoe; 11, 18th-century military boot; 12, military boot, 1789; 13, military boot, 1851; 14, woman's shoe, 1851.*

1780, when latchets went out, toes became pointed, and heels small. About 1800 the heels practically disappeared, the soles assumed quaint shapes, and shoes were attached sandal fashion by ribbons around the ankle. From 1840 on ladies' shoes began to have heels again and large rosettes. About 1870 came round toes with low, round front and bow and high heels, and high shoes either buttoned or laced.

The manufacture of shoes in North America was begun in 1629 by Thomas Beard, a resident of Plymouth Colony. Seven years later Philip Kertland of Buckinghamshire, England began to make shoes in Lynn, Massachusetts Bay Colony, and after that time Massachusetts led the other colonies (and, later, States) in the boot and shoe industry. Up to the middle of the 19th century shoes were made by hand, and the shoemaker was often an itinerant workman. The first invention that materially changed the methods of the shoemaker was a machine for fastening soles and uppers together. About 1850 the rolling machine, by which the sole leather was thoroughly compressed in a minute, was introduced. The process previously had required an hour's time of laborious pounding with hammer and lapstone. Later the sewing machine was adapted to the sewing of leather uppers. About the same time the application

of power to the running of shoemaking machinery permitted the consolidation of the various branches of shoemaking in a single factory. In 1860 the McKay sewing machine, for sewing uppers and soles together, was invented; it at once revolutionized the industry. An improvement upon this invention was the Goodyear welt machine, introduced about 1877, which makes possible the securing of uppers and soles by means of an external seam. In 1881 the invention of the Reese buttonhole machine further narrowed the sphere of hand sewing in the manufacture of shoes. Of the other early inventions the more important are the cable screw-wire machine for fastening uppers and soles together (1869); Bigelow's and McKay's heeling machines (1870); and the edge-trimming machines (1876). Since then polishers and trimmers and many other important machines have been developed.

Among the manufactures of the United States boots and shoes hold an important place, and tariff questions relating to the industry have been the subject of many controversies. The tariff of 1930 imposed on leather boots and shoes a duty of 20 percent ad valorem, bringing about a considerable decline in both exports (chiefly to Canada and Cuba) and imports (chiefly from Czechoslovakia, Great Britain, France, and Switzerland). Exports per year previous to the tariff averaged 4,000,000 pairs annually; after the tariff went into effect annual exports averaged about 3,000,000 pairs. Imports prior to the tariff averaged 5,000,000 pairs per year; after the tariff the annual average rate was 1,00,000 pairs. The total pairs manufactured in the United States in 1930 were about 361,000,000. In 1952 the approximately 1500 shoe factories in the United States manufactured about 508,534,000 pairs of shoes, sandals, and play shoes. Retail sales amounted to about $1,693,-000,000. There are in the United States about 50,000 shoe-repair shops.

BOPP, Franz (1791–1867), German philologist, born in Mainz, and educated in Aschaffenburg, Paris, and London. He became in 1821 professor of philology and Oriental literature in the University of Berlin. His most important labors centered in the analysis of the grammatical forms of the languages of the Indo-Germanic family, and from this work he is known as the founder of the science of comparative philology. In his honor the *Bopp-Stiftung,* for the promotion of the study of comparative philology, was founded in Berlin in 1866. His library was purchased by Cornell University. Among his works are *The Conjugation of the Sanskrit Verb* (1816); a comparative grammar of the Sanskrit, Zend, Armenian, Greek, Latin, Lithuanian, Old Slavic, Gothic, and German languages (1833–52); many dissertations on such languages as Celtic (1838), Malay-Polynesian (1840), Georgian (1846), Borussian (1853) and Albanian (1854); and *Vergleichender Akzentuations-System* (1854).

BORAGE, an erect, rough European herb (*Borago officinalis*), with ovate leaves and blue flowers in terminal racemes. The leaves are edible, and are occasionally used in Europe for making medicinal and refreshing drinks. In the U.S. borage is cultivated principally as a honey plant from which bees may obtain nectar. A similar species, *B. laxiflora,* is occasionally planted in rock gardens for its ornamental blue flowers.

BORAGINACEAE, or Borage Family, a family of dicotyledonous plants in the order Polemoniales. The family comprises chiefly herbs, with a few woody shrubs. The stems and alternate, toothless leaves are hairy; the five-petaled flowers, generally tube-shaped, grow on one side of a curled spike which straightens as the blossoms expand. There are about 80 genera and 1200 species. Among the genera are heliotrope, borage, bugloss, forget-me-not, gromwell, hound's-tongue, lungwort (qq.v.), comfrey, and viper's bugloss.

BORAH, William Edgar (1865–1940), American statesman, born at Fairfield, Ill., and educated at the Southern Illinois Academy and the University of Kansas. He began the practice of law at Lyons, Kans., in 1889. Two years later he moved to Boise, Idaho, continuing his law practice there. In 1907 he was elected U.S. Senator (Republican) from Idaho and was re-elected to the office for five more terms in succession. From 1908 to 1912 Borah was a member of the Republican National Committee. At the time of the 1912 split in the Republican party between the supporters of William Howard Taft and those of Theodore Roosevelt, Borah denounced the Republican nomination of Taft, but remained within the party; he preferred to be considered a progressive Republican rather than a Roosevelt-Progressive.

In the Senate he was chairman of the standing committees on education and labor, and foreign relations, and also of many temporary committees. In domestic affairs he was noted for his opposition to economic monopolies, and for his advocacy of Federal licensing of corporations. Although in 1920 he

opposed entrance of the United States into the League of Nations and the World Court, Borah was an advocate of world peace and disarmament and supported the international conference for limitation of arms which took place in Washington, D.C., in 1922. As chairman of the committee on foreign relations (1924–32), he helped secure Senate ratification (January, 1929) of the Kellogg-Briand Peace Pact. In 1939 he opposed the repeal of the arms clause of the Neutrality Act, which forbade the sale of arms and other war supplies to the nations opposing Nazi Germany in World War II. He died while serving his sixth term as U.S. Senator.

BORAK, in Arabian mythology, an animal with a human face, two wings and a peacock's tail. It was supposed to have carried Mohammed to heaven.

BORÅS, town in Älvsborg County, Sweden, on the Viske River, 45 miles E. of Göteborg (Gothenburg) by rail. The town was founded by King Gustavus Adolphus in 1632. The manufacture of textiles is its principal industry. Pop. (1953) 59,712.

BORAX, or SODIUM TETRABORATE, chemical compound, $Na_2B_4O_7 \cdot 10H_2O$, crystallizing in the monoclinic system, with hardness 2 and sp.gr. 1.7. When heated it swells, gives off water, and fuses easily, forming a glasslike mass. Known and used since early times, borax occurs in nature as a mineral, first discovered in Tibet and exported to Europe under the name *tincal.* In modern times this source was replaced by extensive deposits of borax and related minerals in California, in Stassfurt, Germany, in Tuscany, Italy, and in the Atacama Desert, Chile. More than 200,000 tons of borax are produced each year in the United States alone.

The mineral *kernite* or *rasorite,* $Na_2B_4O_7 \cdot 4H_2O$, is identical with borax except for its water content, its hardness (3), and its sp.gr. (1.95). Formed from borax through some unusual combination of geological conditions, it is found near Kramer, Calif., and is today the chief source of borax.

Borax dissolves readily in water, forming an alkaline, antiseptic solution. This solution is used as disinfectant, detergent, and water softener. Borax is an excellent flux for soldering and welding because it dissolves the coating of metallic oxide to leave a clean metal surface. Borax beads are used in the chemical laboratory for analytical purposes; different metallic oxides when melted with borax form beads of differently colored borates. Borax is used also in the manufacture of ceramics, enamel, and glass. *Pyrex glass* is a trade name for a type of heat-resistant glass made with 30 lbs of borax for every 100 lbs. of finished glass.

Combined with the plastic casein, borax is used in making such products as paint, calcimine, and coated paper. *Jewelers' borax* is a partly dehydrated borax, $Na_2B_4O_7 \cdot 5H_2O$, used as a flux in soldering and assaying precious metals. See also BORIC ACID; BORON.

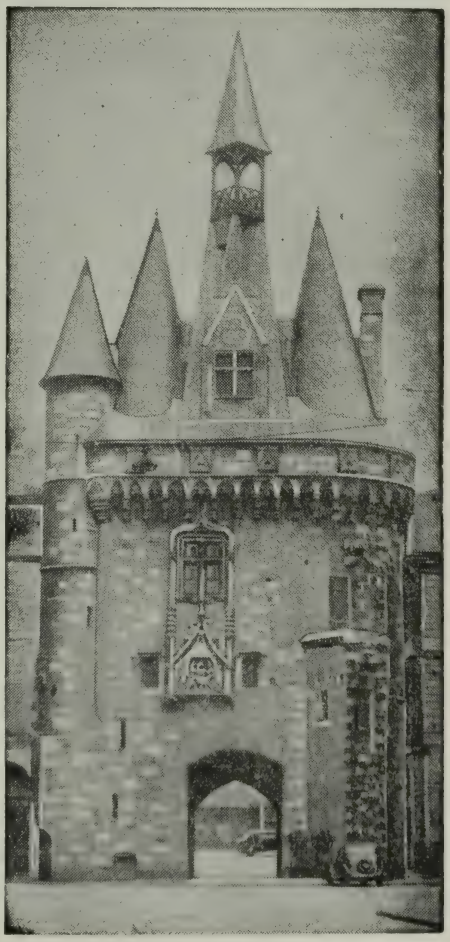
BORDEAUX, seaport and capital of the department of Gironde, France, situated on the W. bank of the Garonne R., about 60 m. from the Atlantic Ocean. It is the fourth-largest city in population of France, and an archiepiscopal see. Lying along a broad bend in the Garonne, the site of Bordeaux is crescent-shaped. A railway bridge and a seventeen-arch pedestrian and vehicular bridge, completed in 1821, span the river from the city to the town of Bastide, on the opposite bank. The central section of the city is well planned, with wide streets, spacious squares, and many imposing buildings. Surrounding this section, which was constructed during the 18th century, is the old section, with narrow, crooked streets and numerous wooden structures in the 15th-century architectural style.

One of the principal points of interest in the city is the Porte de Bourgogne, an arched gate, dating from the 8th century, at the terminus of the vehicular and pedesrian bridge. Ecclesiastical edifices of note include the cathedral of Saint-André (consecrated in 1006), which is surmounted by towers 160 feet in height; the church of Saint-Croix, a Romanesque basilica of the 12th and 13th centuries; and the church of Saint-Seurin, dating from the 11th to the 15th centuries. The university, founded in 1441, has faculties of law, science, letters, medicine, and pharmacy. Other points of interest in the city include the Hôtel de Ville, former residence of the archbishops; the Bordeaux Library, which contains 200,000 volumes and many valuable manuscripts; the Grand Théâtre, an 18th-century structure; and several art museums.

Bordeaux ranks third among French ports in volume of waterborne commerce handled and is accessible to ocean-going vessels. The Canal du Midi links the city with the Mediterranean Sea. Trade is chiefly with Great Britain, Spain, Portugal, Argentina, and the United States. Exports include the famous Bordeaux wines, brandy, talc, ochre, turpentine, walnuts, fruits, and vegetables. Among

French Press & Info. Service;
French National Tourist Office

Above: View of the harbor in Bordeaux.
Right: Gate in the old part of Bordeaux.



the imports are grain, timber, iron, pyrites, machinery, and hardware. The port is headquarters for a fishing fleet which voyages annually to the Newfoundland and Iceland cod fisheries. The chief industries of the city include shipbuilding and the manufacture of railroad cars, leather, hardware, machinery, chemicals, pottery, and articles connected with the wine trade, such as bottles, corks, and straw and wooden containers. Also in Bordeaux are flour mills, sugar refineries, cod-drying plants, canneries, breweries, and distilleries.

Prior to the Roman conquest of Gaul, the city, then known as *Burdigala,* was the capital of the region held by the Bituriges Vivisci, a powerful Celtic tribe. It fell to the Romans in the 1st century, and developed into a flourishing commercial center. In the 4th century it was made the capital of the province of Aquitania Secunda. After the collapse of the Western Roman Empire in the 5th century it was held for varying periods by the Goths, Saracens, and Normans. In 1154, through the marriage of Eleanor of Guienne to Henry of Normandy (afterward Henry II of England), Bordeaux became a dominion of England. The English withdrew from the city in 1451, during the Hundred Years' War, as a result of reverses inflicted by the French. During the 16th century, a period of intense religious strife in France, Bordeaux was an important center of Protestantism. The city was a stronghold of the

Gironde, a moderate republican faction, during the French Revolution. Severe reprisals were inflicted on the Bordeaux Girondists during the Reign of Terror, when the revolutionary government of France was in the hands of extremists. The city became the seat of the French government in the final stages of the Franco-German War. During World War I the French government again moved to Bordeaux, and the city served as the seat of government from June 14 to 29, 1940, in World War II, but was soon thereafter occupied by the Germans, in accordance with the armistice terms imposed after their victory over France. French troops cleared the city of the last Nazi troops in April, 1945. Pop. (1946) 253,751.

BORDEAUX MIXTURE, a mixture of approximately equal parts by weight of bluestone (hydrated copper sulfate) and quicklime (calcium oxide), used in suspension in water as a plant spray. It is industrially the most important fungicide in the U.S. It was discovered in 1882 by the French botanist Alexis Millardet (1838–1902), who noticed that when sprayed on grape vines to simulate poison and thus prevent theft of grapes, it killed the fungi which were destroying the vines. Bordeaux mixture leaves a noticeable bluish deposit on the plants, which must be removed from the edible portions.

BORDEAUX WINES, fine red and white wines, made from grapes harvested in the Gironde Department of France and named for the capital city of the department. The red varieties of Bordeaux wines are generally referred to in England as claret. Like most French wines, the products of the Gironde region vary in quality and are frequently designated by the name of the producing town or vineyard. The best red Bordeaux wines coming mainly from Saint-Emilion, Graves, and Médoc, include Château Latour, Château Lafite, and Château Margaux, all of which are Médoc products. Château Haut-Brion, made in Graves, and Château Ausone, made in Saint-Emilion, are also red wines of excellent quality. Among other outstanding red varieties are those known as Côtes, Palus, and Entre-deux-mers. The best white Bordeaux wines, classified into two types, are produced in the vineyards of Barsac and Sauternes, the names of which are used to distinguish one type from the other. One of the best-known white Bordeaux wines is Château Yquem, a Sauternes product. Other popular varieties include Preignac, Bommes, Martillac, and Saint Médard. Well-blended and properly aged Bordeaux wines have a rich bouquet and are highly palatable, qualities which make both the red and white varieties desirable among connoisseurs as table wines.

BORDEN, Gail (1801–74), American inventor, born in Norwich, N.Y. About 1849, Borden, then living in Texas, became interested in the production of supplies for travelers going West, and invented the "meat biscuit", a kind of concentrated food. In 1856 he received a patent for the production of evaporated milk, and opened plants in Connecticut and Illinois, the first in the U.S. for the commercial production of evaporated milk. The Army and Navy used large quantities of this milk during the Civil War. In later years Borden also produced condensed meat juices, fruit juices, coffee, cocoa, and tea.

BORDEN, Sir Robert Laird (1854–1937), Canadian statesman, born at Grand Pré, Nova Scotia. He studied law at Halifax and became a leading attorney in Nova Scotia. In 1896 he was elected a Conservative member of the Canadian House of Commons, and in 1901 became leader of the Conservative opposition. After the Liberal defeat in 1911, Borden became Premier. In 1917 he formed a Coalition government and remained at its head until ill health forced him to resign the premiership in 1920.

During World War I he was a member of the Imperial War Cabinet, took part in the Imperial War Conference in London, and in 1919 represented Canada at the Paris Peace Conference. He also represented Canada at the Washington Disarmament Conference (1921–22) and at other international conferences. He is the author of *Canadian Constitutional Studies* (1922) and *Canada in the Commonwealth* (1929); the Rhodes Memorial lectures he delivered at Oxford University, 1927.

BORDER STATES, in United States history, name applied immediately preceding and during the Civil War to the States on the borders of the slave-owning Southern States. Their citizens were sharply divided on the slavery issue, and it was with the help of the pro-abolitionists among them that many slaves escaped to the Northern States. The border States were Delaware, Maryland, Kentucky, Virginia, and Missouri.

BORDER WAR, in United States history, the conflict in Kansas Territory between adherents of the Free-Soil Party (q.v.) and a proslavery group known as Border Ruffians.

Precipitated by the passage (1854) of the Kansas-Nebraska Bill, a Congressional enactment which provided for local option in Kansas and Nebraska on the slavery issue, the war continued intermittently for almost four years. The Border Ruffians, consisting chiefly of Southerners who had emigrated to Missouri, conducted systematic raids into Kansas during the war, terrorizing and murdering antislavery settlers. On several occasions, notably in March, 1855, during elections for a Territorial legislature, armed bands of Border Ruffians seized control of the polls in many Kansas communities and unlawfully voted proslavery candidates into office. The Free-Soil settlers, largely emigrants from the New England States, inflicted many sanguinary reprisals on the Border Ruffians and their supporters in Kansas. One of the most memorable of these actions was the abolitionist John Brown's attack (May, 1856) on Pottawatomie (see BROWN, JOHN). The antislavery forces finally triumphed in the Border War, but the bitterness engendered by the struggle deepened the cleavage between North and South and accelerated the drift toward civil war. See KANSAS: *History*.

BORDET, JULES (1870–), Belgian pathologist and bacteriologist, born in Soignies, and educated at the University of Brussels. From 1894 to 1901 he worked at the Pasteur Institute in Paris; in the latter year he returned to Brussels and there organized a Pasteur Institute, of which he became director. Bordet's contributions were largely in the study of blood serum and the mechanisms of immunity. He discovered the phenomenon of "complement fixation", whereby a substance called the complement, present in the blood, combines with an injected or foreign substance to form the antibody causing immunity. Complement fixation is the basis of the well-known Wassermann test for syphilis and numerous other tests for the diagnosis of infectious diseases. Bordet made several other discoveries in the fields of immunity, anaphylaxis, and blood clotting, including discovery of the bacillus which is the probable cause of whooping cough. He was awarded the Nobel Prize in medicine in 1919. Among his works is *Traité de l'Immunité dans les Maladies Infectieuses* (1920).

BORDIGHERA, town of Imperio Province, Liguria, Italy, situated on the Mediterranean Sea, about 7 miles E. of the French border. It is a popular winter resort of the Italian Riviera, with an excellent climate and many scenic attractions. Palm branches grown in Bordighera are sent to St. Peter's in Rome and to other churches for Palm Sunday. The town also has a large trade in cut flowers. Pop. (1936) 5978.

BORE, or EAGRE, in physical geography, a wave front of considerable height, advancing swiftly up a funnel-shaped estuary or bay; less precisely, any tidal current of similar height and velocity but without the abrupt wave front. A large volume of water accumulates in the mouth of the funnel more rapidly than it can flow upstream, and a crested wave, stretching across the estuary, gradually forms and rushes up the estuary with great violence. Bores occur during spring tides, and the height of the wave front may be influenced by wind conditions. Bores ranging from 30 to 50 ft. in height occur in the Bay of Fundy, Canada, and in the Severn River, England, bores up to 18 ft. in height are frequent phenomena. Large bores occur also in the Amazon River, Brazil, the Brahmaputra River, India, and the Fuchun River, China. See also TIDES; TSUNAMI.

BOREGAT. See ROCK TROUT.

BORER, name commonly given to any of a wide variety of animals which bore in or through the hard parts of plants or of other animals, or which make tubular burrows. The boring action is in most cases mechanical, but is often supplemented by the softening action of chemical secretions. Many of these borers destroy plants and animals of economic value, or structures built by man.

The simplest animals called borers are the boring sponges, such as *Cliona sulphurea*, which often wreak havoc in oyster beds. Certain starfish also bore through the shells of oysters in order to eat the soft inner parts, and the related sea urchins are in some cases well equipped with protruding mouthparts, with which they bore, or at least enlarge, holes in which they dwell.

Among the mollusks, the common snail has an effective boring apparatus; it can bore its way through a cardboard box within a few minutes. Snails, and such related mollusks as whelks (q.v.), have structures called odontophores with which they bore through the shells of clams or even into coral colonies. A marine snail which is very destructive to oysters off the Atlantic coast of the U.S. is a borer known as the drill (q.v.). The shipworm (q.v.), a bivalve mollusk, is a formidable pest which bores into wood.

The most important borers are found among the insects and their relatives the crustaceans. An isopod crustacean, the gribble (q.v.), de-

vours the wood of harbor piles. Among the numerous varieties of insects, one or another will often be found boring in almost any type of organic matter. Names like corn borer and potato borer almost always apply to insects; the former is the larva of a moth, the latter of a beetle, representatives of the two most important orders. Flies of the genus *Trypeta* are called bore flies, and their larvae do a great deal of damage to some plants. For further information on boring insects, see the various articles under the names of the plants attacked; see also BOOKWORM; TERMITES.

BORGER, city in Hutchinson Co., Texas, located in the Texas Panhandle, about 45 miles N.N.E. of Amarillo. Known as the "Carbon Black Center of the World", Borger produces more than 50% of the world supply of this substance annually. Other industries include the production of natural gas and petroleum. Borger was incorporated as a city in 1926. Pop. (1950) 18,059.

BORGERHOUT, a suburb east of Antwerp, Belgium. Diamond-cutting establishments, dye-houses, bleaching works, and tobacco factories are located in the town. Pop. (1952 est.) 50,604.

BORGHESE, name of an Italian noble family, originally from Siena, which included: **1.** CAMILLO BORGHESE (1552–1621), born in Rome. He was elected Pope (1605), assuming the title of Paul V. **2.** CARDINAL SCIPIONE BORGHESE (d. 1633), nephew of Camillo. His real surname was Caffarelli. He was appointed a cardinal by his uncle, and built the Villa Borghese, an estate just outside Rome, containing extensive grounds, a number of temples, artificial ruins, and statuary. The Villa Borghese was acquired by the Italian government in 1902, was later renamed Villa Umberto I, and is now a public park. **3.** PRINCE CAMILLO FILIPPO LODOVICO BORGHESE (1775–1832). During the Napoleonic Wars he aided the French in their invasion of Italy and entered their service. He married Maria Paulina Bonaparte, sister of Napoleon, in 1803, and in the following year was made a prince of France by Napoleon. He later fought in the Napoleonic campaigns against the Austrians, Prussians, and Russians, and was made Duke of Guastalia. From 1807 to 1814 he was governor of Piedmont, under the French. During this time he sold to Napoleon the famous art collection housed in the Villa Borghese. Following the abdication of Napoleon in 1814, Borghese severed his connections with the Bonaparte family, separated from his wife, and recovered part of his former art collection. He was the owner of large properties in the kingdoms of Savoy and Naples.

BORGHESE GLADIATOR, life-sized statue of an armed warrior, executed by Agasias of Ephesus, Greek sculptor of the 1st century B.C. The statue was formerly in the Borghese collection in Rome; by order of the French emperor Napoleon I it was sent to the Louvre, in Paris, where it has since remained.

BORGIA, CESARE (1475 or 1476–1507), Italian ecclesiastic and soldier, son of Pope Alexander VI, born in Rome. In 1493, about a year after his father's election to the papacy, Borgia was made a cardinal. He soon became notorious for his licentious habits and violent temper, and in 1497 he was suspected of complicity in the assassination of his brother Giovanni, Duke of Benevento and of Gandía. In August, 1498, he relinquished his cardinalate; a few months later he was sent to France as papal legate to convey to King Louis XII an annulment of the king's marriage to his consort Jeanne. Louis rewarded him with the duchy of Valentinois, a bodyguard of 100 men, and 20,000 livres of yearly revenue. In 1499 Borgia married a sister of the king of Navarre and accompanied Louis XII to Italy; there he undertook the conquest of Romagna for the Holy See, but was unsuccessful. He led a victorious expedition against that region in 1500, and in 1501 Pope Alexander created him duke of Romagna. Later in 1501 Borgia seized the principality of Piombino, but failed in an attempt to acquire Bologna and Florence. He then took Camerino and the duchy of Urbino.

Following the conquest of Urbino a number of his enemies joined forces and rebelled. Several defeats were inflicted on Borgia's army, but a group of the rebels, confronted with the threat of French intervention, withdrew from the rebellion. Hoping to placate Borgia, the deserters captured the town of Senigallia, still held by followers of the duke of Urbino. Borgia ordered the arrest of the entire group after his arrival at Senigallia; two of the leaders were executed.

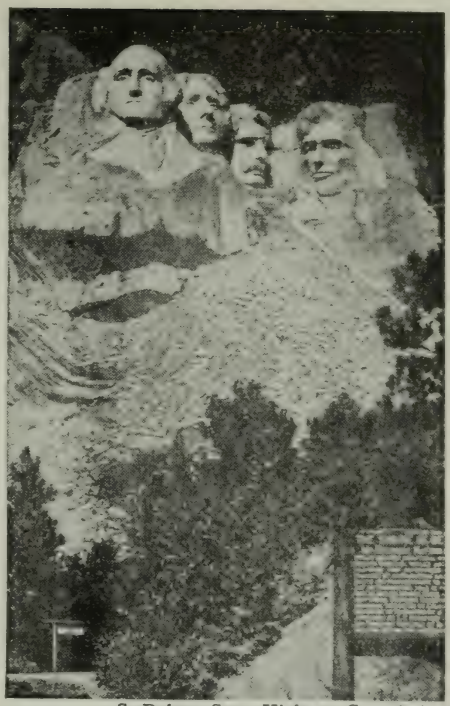
Borgia's enemies resumed the struggle for their possessions following the death (Aug. 18, 1503) of his father. During the next two months they seized Urbino, Pesaro, Rimini, and other portions of his dominions. Pope Julius II, who was elected on Nov. 1, deprived him of the remainder of his holdings and allowed him to depart for Naples, then under Spanish control. Accused of conspira-

torial activities in that city, Borgia was placed under arrest in May, 1504, and taken to Spain, where he was imprisoned in the castle of Medina del Campo until November, 1506; he then contrived to escape to Navarre, and joined the Navarrese king in an expedition against Castile. Borgia was killed in action at Viana.

Like many of his contemporaries, Borgia was unscrupulous, treacherous, and cruel toward his political rivals, but he also had several admirable qualities, incuding a benevolent attitude toward his subjects. He is the prototype of the prince portrayed in *Il Principe,* the chief work of the Italian political philosopher Niccolo Machiavelli.

BORGIA, Lucrezia (1480–1519), daughter of Rodrigo Borgia, born at Rome. She was married first to Giovanni Sforza, Lord of Pesaro, but her father, on the ground of her husband's impotence, annulled this marriage and gave her to Alfonso, Duke of Bisceglie, nephew of the King of Naples. Alfonso, believing that Cesare Borgia had sought his life, tried to retaliate, and was in turn cut to pieces by his own bodyguard at Cesare's command. For the third time free, Rodrigo's daughter became, in spite of the repugnance of the Duke Ercole d'Este, the wife of the latter's son, Alfonso, who soon after inherited the Duchy of Ferrara. Lucrezia established at Ferrara a court at which gathered the foremost artists, writers, and scholars of the time. Lucrezia's reputation suffered from her associations with unscrupulous relatives, and unwarranted charges, which were later refuted as devoid of historical proof, were made against her.

BORGLUM, Gutzon (1871–1941), American sculptor and painter, born in Idaho. His full name was John Gutzon de la Mothe Borglum; he was the brother of Solon Hannibal Borglum (q.v.). Gutzon Borglum studied art at the San Francisco Art Association, and in Paris at the Julian Academy and the École des Beaux-Arts. He specialized in the sculpture of American subjects. Borglum designed and partially executed the Stone Mountain (Ga.) memorial to the Confederacy, a gigantic bas-relief a quarter of a mile in length, cut out of the mountain. He is most famous for his work for the Mount Rushmore National Memorial, which he carried on from 1927 to his death. The memorial consists of colossal heads of George Washington, Thomas Jefferson, Theodore Roosevelt, and Abraham Lincoln, cut out of a granite mountainside at Mount Rushmore,



S. Dakota State Highway Commission

Gutzon Borglum's Mt. Rushmore memorial in granite of four great American statesmen

South Dakota. The faces, looking out from an elevation of 500 feet, are from 60 to 70 feet high, yet possess great realism of detail and expression. The project, unfinished at Borglum's death in March, 1941, was completed in November of that year by his son, Lincoln Borglum, who had been working on it with his father for the preceding 14 years.

Among the other works of Gutzon Borglum are the group "North America" (building of the Bureau of American Republics, Washington, D.C.); "Sheridan Monument" (Washington, D.C.); "Wars of America" (42 bronze figures, Military Park, Newark, N.J.); "Mares of Diomedes" (Metropolitan Museum of Art, New York City); and the "Twelve Apostles" (12 colossal figures for the Cathedral of St. John the Divine, New York City). Among his paintings are "Captive Pan", "Iago and Cassio", and mural decorations in Leeds and Manchester, England.

BORGLUM, Solon Hannibal (1868–1922), American sculptor, brother of Gutzon Borglum (q.v.). He was born in Ogden, Utah. After a course at the Cincinnati Art School,

he studied with Emmanuel Frémiet in Paris. Many of his works, dealing with cowboys and Indians, reveal intimate knowledge of life on the western plains. Among his principal works are "Stampede of Wild Horses" (Cincinnati Museum), "The Last Roundup" and "On the Borders of White Man's Land" (Metropolitan Museum, N.Y.C.), "Burial on the Plains", "Tamed", "Just Born", and "The Bucking Broncho". Later works include numerous portrait busts of Civil War heroes and portrait reliefs such as that of Brig. Gen. Joseph A. Mower (Vicksburg Battlefield). Borglum was an associate of the National Academy and a member of the National Sculpture Society. The French Government awarded him the Croix de Guerre for valor under fire in World War I, during which he served as Y.M.C.A. secretary with the French army.

BORI, Lucrezia, real name Lucrecia Borja Gonzalez de Riancho (1888–), Spanish lyric soprano, born in Valencia, and trained privately in Italy. She made her debut in 1908, at the Costanzi opera house in Rome, singing the role of Micaëla in *Carmen,* by the French composer Georges Bizet. During the following years she filled opera engagements in Paris, Milan, Naples, and Buenos Aires. She made her American debut in 1912, at the Metropolitan Opera House, New York City, in the title role of *Manon Lescaut,* by the French composer Jules Massenet. Lucrezia Bori's American reputation was not firmly established, however, until 1914, when she appeared with great success in the role of Fiora in *L'Amore dei Tre Re,* by the Italian composer Italo Montemezzi. The following year a throat ailment forced her to retire temporarily from the stage. She returned to the Metropolitan Opera Company in 1921, and from that year until her final retirement in 1936 was generally considered the leading lyric soprano of the company.

BORIC ACID, less properly called Boracic Acid, H_3BO_3, a white, crystalline powder which loses water on heating; becoming metaboric acid, HBO_2, at 107° C. (225° F.); tetraboric or pyroboric acid, $H_2B_4O_7$, at 140° C. (284° F.); and boric oxide, B_2O_3, at about 300° C. (572° F.). These substances become boric acid again when dissolved in water.

Boric acid is soluble in alcohol. In water a saturated solution of boric acid contains 2% at 0° C. (32° F.), 39% at 100° C. (212° F.). It is slightly volatile in steam, and steam issuing from certain volcanic fissures in Italy contains appreciable amounts of boric acid. It is not otherwise found pure in nature, but is prepared from borax by treatment with sulfuric acid. It was first made in 1702 by the Dutch chemist Willem Homberg, who used this method. Salts of boric acid itself are rare, but the related acids mentioned above yield salts, collectively known as borates. The acidity of boric acid is so weak as to be barely detectable by the usual tests (see Acids); however, it is classed as an acid in standard chemical lists. It is a mild, nonirritating, and slightly astringent antiseptic, and as such is extensively employed in medicine, particularly as an eyewash. It was once used as a food preservative, but was found harmful when taken internally. See Borax; Boron.

BORING. See Drill.

BORING, Edwin Garrigues (1886–), research psychologist, born in Philadelphia. He was educated at Cornell and taught there and at Clark University before his appointment to Harvard in 1922. From 1924 to 1949 he served as director of the psychological laboratory and after 1928 as professor of psychology at Harvard University. His most important work was done in the field of sensation and perception. Among his works are *A History of Experimental Psychology* (1929), *The Physical Dimension of Consciousness* (1933), *Sensation and Perception in the History of Experimental Psychology* (1942), and *Foundations of Psychology* (1948).

BORIS I (d. about 907), Czar of Bulgaria from 852 to 889. He succeeded his father, Pressian, and in 854–55 he conducted unsuccessful campaigns against Serbia and Croatia. Under pressure from the Byzantine Emperor Michael III, Boris embraced Christianity in 865 and imposed baptism on all his subjects. In 870, after wavering between adherence to the Western and Eastern churches, Boris decided for the latter when the Pope failed to meet his demand for the appointment of an archbishop for Bulgaria. Boris voluntarily abdicated the throne in favor of his son Vladimir in 889 and retired to a monastery. Vladimir, however, proved to be an incompetent and vicious monarch, and the boyars revolted against him in 893. Boris emerged from retirement and deposed Vladimir, replacing him with Simeon, Boris' younger son. Boris then re-entered his monastery. He is considered a saint by the Eastern Church.

BORIS III (1894–1943), King of Bulgaria, born at Sofia, eldest son of King Ferdinand I and Princess Marie Louise of Bourbon-Parma. He served as a major in the First Balkan War in 1912, and in the Second Balkan War (1913) and in World War I he was aide-

de-camp to the king. On the abdication of his father (October 3, 1918) Boris became king. For 15 years he ruled as a constitutional monarch, taking little part in politics in spite of constant internal disturbances. In 1934 Premier Georgiev suspended the constitution and set up a dictatorship which, in the following year, Boris took over, ruling as a dictator until his death. Boris was responsible for Bulgaria's joining the tripartite pact of the Axis Powers (q.v.) in 1941. During World War II, he furnished troops for operations against Greece and Yugoslavia, but refused to attack the Soviet Union. Boris died under mysterious circumstances, reportedly assassinated by German agents.

BORIS GODUNOV (1551–1605), Czar of Russia, of Tatar origin. Appointed by Ivan IV to be one of the council to assist his young son, Theodore I, who in 1580 married Boris's sister, Boris soon became the real ruler of the country. He created the first Russian patriarchate at Moscow, and won the favor of the boyars by the ukase of 1597, which enforced serfdom on the peasantry. He fostered colonization in Siberia, secured the country against Tatar invasion, and on the death of Theodore in 1598 became czar. Aleksander Pushkin and Count Aleksei Konstantinovich Tolstoi wrote dramas based on his life.

BORISOGLEBSK, a city of the Voronezh Region of the Russian Soviet Federated Socialist Republic, U.S.S.R., located near the confluence of the Vorona and Khoper rivers, about 135 miles S.E. of Voronezh. It is connected by rail and inland waterways with most of the leading cities of the R.S.F.S.R., and serves as the commercial center of the surrounding agricultural region. The principal industries are iron casting and brick making, and the manufacture of flour, tallow, and leather products. Borisoglebsk was founded in 1646 as part of the Russian system of defense against the Cossacks. Pop. (1939) 52,055.

BORJA. See BORGIA.

BORN, BERTRAND DE, VICOMTE DE HAUTEFORT (fl. 12th century), French troubadour. He wrote lyrics on love and war; and his satirical songs intensified the quarrel between King Henry II of England and Henry's sons, Richard and John, who finally resorted to armed rebellion against their father. Born's role in this affair is referred to by Dante in the *Divina Commedia* (*Inferno* XXVIII, 134).

BORN, MAX (1882–), German-British physicist, born in Breslau, and educated at the universities of Breslau, Heidelberg, Zurich, Göttingen, and Cambridge. In 1921, after teaching successively at the universities of Göttingen, Berlin, and Frankfort, he was appointed professor of theoretical physics at Göttingen. In 1933 he went to England as a refugee from Nazism and subsequently, in 1939, acquired British citizenship. During his first three years in England, he conducted research at Cambridge University. He was Tait professor of natural philosophy at the University of Edinburgh from 1936 to 1953, when he became professor emeritus. An outstanding theoretical physicist, Born is noted for his fundamental contributions in quantum mechanics (q.v.). In 1954 he was awarded the Nobel Prize in physics jointly with the German physicist Walter Bothe. His works include *Einstein's Theory of Relativity* (1922), *Atomic Physics* (1935); *Natural Philosophy of Cause and Chance* (1949); *Theory of Crystal Lattices* (with Kun Huang, 1954); and *Principles of Optics* (with E. Wolf, 1955).

BORNEIL, GIRAUD DE (1150?–1220?), French poet, born at Exideuil (Dordogne). Mention is made of him in the *Purgatory* by Dante, who also, in the *De Vulgari Eloquio,* classes him with the troubadours Arnaut Daniel and Bertrand de Born (q.v.). His patrons included Richard I of England (Cœur-de-Lion), Alfonso VIII of Castile, and Pedro II of Aragon. Of his work there have been preserved 82 specimens, many satiric, most of them obscure.

BORNEO, third-largest island in the world (after Greenland and New Guinea), situated in the Malay Archipelago. It is bounded on the E. by the Sulu Sea, the Celebes Sea, and the Strait of Makassar, on the S. by the Java Sea, and on the W. and N. by the South China Sea. Politically Borneo is divided into British Borneo and Indonesian Borneo. The former occupies about 78,100 sq.m. of the northern part of the island, and consists of British North Borneo and Sarawak (qq.v.), both crown colonies, and Brunei (q.v.), a protectorate. Indonesian Borneo, formerly called Netherlands Borneo and now forming part of the Republic of Indonesia, consists of the southern, western, and most of the eastern part of the island, and has an area of about 208,268 sq.m. The total area of the island is 286,383 sq.m.; the population is about 3,200,000.

The chief towns are Jesselton and Kudat, in British North Borneo; Brunei, in Brunei; Kuching, Miri, and Sibu, in Sarawak; and Bandjermasin and Pontianak, in Indonesian Borneo. A railroad line, in British North Borneo, extends for about 96 m. from Jessel-

Netherlands Info. Bureau; Black Star, N.Y.

Borneo village totem pole to frighten away evil spirits, and a Dyak tribesman

ton inland to Melalap, with a branch to the coastal town of Weston.

For the most part the island is mountainous, with the principal uplifts concentrated in the northern and central sections. Elevations in the chief ranges average between 3000 and 7500 ft. Mt. Kinabulu (13,455 ft.), the highest peak on the island, is in N. British North Borneo. Numerous rivers form the main arteries of internal commerce. Among the most important are the Batang Lupar, Saribas, Rajang, and Baram in the northwest; the Kinabatangan in the northeast; the Kapoeas in the southwest; the Barito in the south; and the Mahakam or Koetai in the east.

Borneo has a tropical climate, with an annual temperature averaging around 78° F. Extreme humidity prevails in many sections of the island, especially the coastal regions. Precipitation is heavy, averaging about 160 inches annually for the island as a whole and exceeding 225 inches annually in some localities. Maximum precipitation occurs between October and May, the period of the northeast monsoon.

Vegetation is luxuriant and highly diversified. In the mountain regions rhododendrons, orchids, pitcher plants, and other varieties of flowering plants grow in great profusion. Indigenous fruit trees include the coconut palm, orange, banana, and mango. More than fifty species of timber trees abound in the island's dense forests, notably teak, ironwood, ebony, and sandalwood. The indigenous vegetation yields a large variety of commercially valuable products, including camphor, guttapercha, coffee, sugar, copra, cotton, spices, nuts, and tobacco.

Borneo's fauna includes the elephant, found in the N. portion of the island, and the rhinoceros. The most common large quadrupeds are the orangutan, gibbon, proboscis monkey, and wild ox. Among the smaller quadrupeds are several species of macaque monkey, the tiger cat, tapir, honey bear, porcupine, flying squirrel, flying fox, and various species of deer. The reptilian fauna includes the crocodile, many varieties of lizard, and the python and numerous other species of snake. Eagles, falcons, vultures, parrots, peacocks, flamingoes, hornbills, pheasants, pigeons, and swifts are among the avifauna.

Among the mineral resources of the island are coal, gold, copper, tin, iron, manganese, platinum, nickel, arsenic, mercury, diamonds, and semiprecious stones, clay, petroleum, and sulfur. Poor transportation facilities impede development of the mining industry. The agricultural products of the island include rice, millet, sweet potatoes, yams, sugar cane, and pineapples and other tropical fruits. Gold, diamonds, coal, forest products, cotton, petroleum, wax, timber, camphor, sago flour, dried fish, and trepang (sea cucumbers) are the principal exports. Imports include earthenware; metal articles, piece goods, yarns, woolen and silk fabrics, medicines, foodstuffs, tea, tobacco, and gunpowder.

The population consists of three main groups: the Dyaks (q.v.), the aboriginal heathen inhabitants, comprising the great majority of the people; the Malays, whose chief occupations are trading, farming, and fishing; and the Chinese, who are mainly traders. Europeans, Eurasians, and Indians are few in number.

History. Chinese traders began to visit Borneo as early as the 5th century, but many centuries elapsed before they established colonies. About the 6th century invaders from southern India seized various parts of the island, and its S. portion was occupied by settlers from Java and Sumatra. Another large

group of intruders came from the Malay Peninsula during this period.

Mohammedanism was introduced by Arabs from Palembang in the 16th century. Borneo became known to Europeans after 1511, as a result of the Portuguese search for the Molucca, or Spice, Islands. At the end of the 16th century, the Portuguese, Spanish, Dutch, and English were active competitors for the control of the island's trade. By warfare and treaties the Dutch gradually obtained possession of the entire southern part of the island, and the British took control of the northern part. A struggle between the British and the Dutch for complete control of Borneo ended in 1891, when agreement was reached to divide the island according to its present boundaries. Japanese forces invaded Borneo in December, 1941, during World War II, and in the next three months completely occupied the island. American bombing planes conducted frequent raids against Japanese installations on the island during 1944–45. Borneo was invaded by Australian troops on May 1, 1945. Following the surrender (Aug. 14, 1945) of Japan the various political divisions were under Allied military occupation until 1946, when civil administration was resumed. British North Borneo and Sarawak, formerly protectorates, were reorganized as crown colonies in July, 1946. Dutch Borneo was divided into five Indonesian States after its liberation, and in December, 1949, these States became constituent units of the newly established United States of Indonesia. On Aug. 15, 1950, Indonesian Borneo merged with the other States of the U.S.I. into a single, centralized republic, officially styled the Republic of Indonesia.

BORNHOLM, island and county of Denmark, in the Baltic Sea, about 20 miles S.E. of Sweden. It extends about 24 miles S.E. to N.W., and about 16 miles E. to W. Most of the island is a hilly, rocky plain, about 270 feet above sea level, and the soil is generally fertile. Among important agricultural products are cattle, oats, butter, hemp, and flax. Industries include the manufacture of porcelain and earthenware, weaving, clockmaking, fishing, and the quarrying of limestone, blue marble, and freestone. Some coal is mined on the W. coast, mainly for local use. Rönne (pop. in 1950, 12,696), the administrative center of Bornholm, is located on the W. coast, and is connected by rail with Nekso, a town on the E. coast. There are four other small towns on the island, but most of its residents live on farms. Prior to 1000 Bornholm was inhabited by vikings. Subsequently it became in turn a possession of Denmark, of the Hanseatic League (q.v.), of Lübeck, and of Sweden, and in 1660 reverted to Danish control. During World War II Bornholm was occupied by German military forces from April, 1940, until May, 1945. Area of Bornholm, 215 sq.m.; pop. (1950) 48,134.

BORNITE, also called PURPLE COPPER ORE or PEACOCK ORE, an important ore of copper. It is a mixed sulfide of copper and iron, the pure mineral containing 63.3% of copper. It generally occurs mixed with other copper minerals. The hardness is 3 sp. gr. about 5.0–5.1; it crystallizes in the isometric system but well-formed crystals are rarely found. A freshly broken piece of bornite shows a bronze color and metallic luster, but rapidly tarnishes, yielding the typical dark, purplish iridescence which has given this mineral its common names. Bornite is mined extensively in Bolivia, Chile, Mexico, and Peru; and, in the U.S., in Arizona, California, and Montana.

BORNU, province of Nigeria, British West Africa, extending W. and S. of Lake Chad. Topographically, the province consists of a level plain. Tropical climatic conditions prevail, and during the hot season (March to September) temperatures over 105° F. are common. Large sections of the province are arid, but the soil is generally fertile. The economy is mainly agricultural; pastoral enterprises include the breeding of horses, camels, sheep, goats, and oxen. Millet, wheat, rice, cotton, and various fruits and vegetables comprise the chief crops. Especially notable among the fauna are the lion, elephant, hippopotamus, giraffe, antelope, crocodile, and ostrich. The Kanuri, a Negroid people with Berber admixtures, form a majority of the population. Mohammedanism is the predominant religion. Maiduguri (pop. in 1930, 24,359) is the provincial administrative center.

Together with the S. portion of Niger, French West Africa, the region comprising Bornu was formerly an independent sultanate, with a history dating from the 9th century A.D. Mohammedanism was adopted in the 11th century. Europeans first visited the country in 1823, and in 1902 it was divided among Britain, France, and Germany. The larger portion of the approximately 50,000 sq.m. of the sultanate came under British control and was constituted a province of Nigeria, with a descendant of the early sultans on the throne. In 1919, after World War I, the German portion of Bornu, which had been included in the German Cameroons, was

mandated to Great Britain, and united administratively with Bornu Province. Area (including mandated territory), 45,900 sq.m., pop. (1931) 1,044,632.

BORODIN, ALEKSANDR PORFIREVICH (1834–87), Russian composer and chemist, born in St. Petersburg. He studied medicine and chemistry at the Medico-Surgical Academy, and was appointed to the chair of chemistry. Amid his professional duties he found time for musical composition as a recreation. His musical studies had begun quite early and at 13 he wrote a concerto for the flute. Later he joined the circle of Mili Alekseevich Balakirev (q.v.) and took up music seriously. He wrote his first symphony in 1862–67, and in 1869 began the opera *Prince Igor,* on a libretto based on the epic *Prince Igor's Band* (q.v.), but soon left the work and utilized the composed parts for his second symphony (1860–76), the so-called "heroic". He then resumed work on the opera, which, however, was still unfinished at his death. It was orchestrated and finished by Nikolai Andreevich Rimski-Korsakov and Aleksandr Glazunov (qq.v.). He also wrote two string quartets besides a score of songs. *On the Steppes of Central Asia* (1880), a "musical picture", is one of his most popular works.

BORODINO, BATTLE OF, battle of the Napoleonic Wars, fought on Sept. 7, 1812, between a French army under Emperor Napoleon I and a Russian army under Marshal Mikhail Ilarionovich Kutuzov. It took place in and around the village of Borodino, about 70 miles w.s.w. of Moscow. Striving to halt Napoleon's advance on Moscow, the Russians, numbering about 121,000 men, erected a line of earthworks across the highway at Borodino. The French army, consisting of about 130,000 men, reached the Russian positions on Sept. 5, and launched its initial assault early the next day. After maneuvering the enemy commander into massing the Russian strength in the center, Napoleon loosed a fierce bombardment, and then a cavalry attack which broke through the lines. The Russians retired, and the French occupied Moscow without further resistance. Russian casualties in the battle, generally regarded as the most sanguinary of the 19th century, numbered about 42,000 men, including 22 generals. Napoleon lost about 32,000 men, including 31 generals. The battle is vividly described in *War and Peace* (1866), a novel by Count Lev Nikolaevich Tolstoi.

BORON, an element, symbol B, at. no. 5, at. wt. 10.82, m.p. about 2300° C. (4172° F.), sp. gr. about 2.5. Compounds of boron, notably borax, have been known since early times, but the pure element was first prepared in 1808 by Gay-Lussac and Thénard in France and independently by Davy in England. Boron is one of the "trace elements" (q.v.) necessary for the growth of plants but required only in infinitesimal amounts.

The original sources of boron compounds were the minerals borax and boric acid. More recently important boron ores have been, in the U.S., ulexite, $NaCaB_5O_9 \cdot 8H_2O$; colemanite, $Ca_2B_6O_{11} \cdot 5H_2O$; and kernite, $Na_2B_4O_7 \cdot 4H_2O$; and in Germany, boracite, $Mg_7Cl_2B_{16}O_{30}$.

Pure boron, as usually prepared, is an amorphous powder. A crystalline form can be prepared, however, by dissolving boron in molten aluminum and cooling slowly. Boron does not react with water or hydrochloric acid and is unaffected by air at ordinary temperatures. At red heat it combines directly with nitrogen to form the nitride, BN, and with oxygen to form the oxide, B_2O_3. With metals it forms borides, such as magnesium boride, Mg_3B_2.

Although boron has a valence of three and its position in the periodic table would indicate a close relationship to aluminum, it is actually much more like carbon and silicon in chemical properties. In its compounds boron acts like a nonmetal, but unlike most nonmetals, pure boron is an electrical conductor, like the metals and like carbon (graphite). Crystalline boron is very similar to diamond in appearance and optical properties, and is almost as hard as the diamond. Most extraordinary in their anomalous similarity to the compounds of silicon and carbon are the boron hydrides. The boron compounds of industrial importance include borax, boric acid, and boron carbide (qq.v.).

Boron has several important applications in the field of atomic energy. It is used in instruments designed to detect and count slow neutrons; see IONIZATION CHAMBER. Because of its high absorption of neutrons, it is employed as a control absorber in nuclear reactors and as a constituent material of neutron shields; see ATOMIC ENERGY.

BORON CARBIDE, B_4C, a synthetic abrasive which is harder than carborundum, almost as hard as diamond, and probably the hardest man-made substance. Although it had been known to chemists for a long time, it was first made industrially in the 1930's.

Boron carbide is prepared by heating boric oxide and carbon together in an electric furnace to a temperature of about 2400° C.

(4352° F.), slightly above the melting point of pure boron carbide. The product of the furnace is a mass of black, shining crystals which look like colored glass. The sp. gr. is from 2.51 to 2.52. Boron carbide does not decompose below 3500° C. (6332° F.), and may therefore be easily heated above its melting point and, unlike carborundum, may be molded into any desired shape without the addition of a glue or bonding agent. It has been made into such articles as abrasive wheels and sandblast nozzles.

BORORO, South American Indian tribe, living in southern Brazil. The Bororo were a powerful people until conflicts with white settlers, beginning about 1880, greatly decreased their numbers. Their indigenous culture has been intensively studied, being typical both of the area in which they live and of the general cultural patterns of the linguistic family, usually called *Bororoan*, to which they belong. In their primitive state, the Bororo lived by hunting, for which they used long bows, and arrows made of cane and tipped with bones or teeth. Polygamy was common, and polyandry was occasionally practiced. Ornamental mutilation, such as ear and lip piercing, was customary. The tribe is noted for the physical proportions of its members, who average over 5 feet 8 inches in height and are remarkable for their strength and agility.

BOROUGH, unit of local government. Among the early Anglo-Saxons, the borough was a fort or fortified place. As law and order developed, it became a group of fortified houses, and finally a town having special duties and privileges. Boroughs existed in England from the earliest times. According to the *Domesday Book*, the record of a survey of England made in 1085–86 by order of William the Conqueror, there were then eighty-two boroughs in that country. Each was ruled by an elective officer, usually called the "portreeve", and had the privilege of a special borough court, which was independent of the larger divisions, known as hundreds and shires. The Normans utilized these units of government, supplanting the portreeves with officers authorized by the throne. By the time of King Henry VI (15th century) most of the boroughs had become municipalities, with the power of government vested in the members of the principal guilds. The boroughs were granted representation in Parliament during this period. In course of time many of the boroughs decreased in population and became little more than names; however, their representatives continued to sit in Parliament. Others came entirely under the control of political machines or of members of the nobility and acted in elections only under such control. These two classes of boroughs received respectively the names "rotten boroughs" and "pocket boroughs". During the 18th century the borough-governing bodies became increasingly corrupt. A widespread reform movement forced (1832) passage of Parliamentary legislation curbing the worst abuses. The Municipal Reform Act of 1835 destroyed the remnants of the old borough system.

Boroughs in present-day England are either incorporated municipalities, known as *municipal boroughs*, or districts which send members to Parliament, known as *parliamentary boroughs*. Two kinds of municipal boroughs exist: the *county borough* has a population of 75,000 and upward, and is exempt from the jurisdiction of the administrative county; the *noncounty borough* is generally a small borough of special or ancient jurisdiction. In addition, there are in Greater London, besides the ancient City of London, 28 *metropolitan boroughs*, each with a mayor, aldermen, and councilors. However, these entities are not, in the statutory sense, municipal boroughs.

During the early period of American colonization, practical considerations made generally inapplicable the English borough system of local government, and the term "borough" is presently applied only to certain incorporated villages in the States of Connecticut, Minnesota, New Jersey, and Pennsylvania, and to the five political subdivisions coextensive with the counties of New York City. See MUNICIPAL GOVERNMENT.

BORROMEO, SAINT CARLO (1538–1584), Italian churchman, born at his father's castle of Arona, on the Lago Maggiore. Appointed by his uncle Pope Pius IV prothonotary apostolic, he was instrumental in the success of the Council of Trent and in the drafting of the *Catechismus Romanus*. As an ecclesiastical disciplinarian, he incurred the hostility of the monks, founding, 1570, the Helvetic College at Milan, and consolidating the seven Swiss Catholic cantons in united defense. Canonized by Paul V in 1610, his works were published at Milan in 1747.

BORROW, GEORGE (1803–81), English linguist and writer, born in Dereham, Norfolk. Beginning the study of languages in his youth, he became proficient in Danish, German, Irish, French, Welsh, Romany, and other tongues. From 1824 to about 1826 he earned a precarious living in London as a

writer and editor. Subsequently he traveled, chiefly on foot, throughout England, experiencing many of the adventures that provided material for *Lavengro, the Scholar, the Gypsy, the Priest* (1851) and its sequel, *The Romany Rye* (1857). He traveled in Russia, Spain, and Portugal from 1833 to 1840, first as an agent of the British and Foreign Bible Society, and later as a newspaper correspondent. Throughout his stay in Europe he associated with gypsies, studying their traditions and customs. *Zincali, or the Gypsies in Spain* (1841), based on observations made during this period, was followed by *The Bible in Spain* (3 vols., 1843), his most successful work. His other works include *Targum, or Metrical Translations from Thirty Languages and Dialects* (1835), *Wild Wales, Its People, Language, and Scenery* (1862), and *Romano Lavo-lil, or Word-book of the Gypsy Language* (1874).

BORST, Lyle Benjamin (1912–), American physicist, born in Chicago, Ill., and educated at the universities of Illinois and Chicago. He held teaching and research posts at the University of Chicago from 1940 to 1943, when he joined the staff of the Clinton laboratories in Oak Ridge, Tenn., to work on the atomic-bomb project. In 1946 he was appointed chairman of the department for the development of nuclear reactors at the Brookhaven National Laboratory. He retained that position until 1951, when he became professor of physics at the University of Utah. In 1954 he was appointed chairman of the physics department of New York University.

A specialist in nuclear-reactor design, Borst is best known for the development of the first practical, atomic-powered locomotive (q.v.).

BORZOI, prior to 1936 known as Russian Wolfhound, a hunting dog originated in Russia in the 17th century by crossing the Arabian greyhound with a Russian breed resembling the modern collie. The borzoi was used in Russia for hunting wolves, hare, and other game. The dog was first imported into the United States from England, in 1889. The borzoi has a long body; a heavy, silky, somewhat curly coat, usually white in color with markings of black, gray, tan, or lemon; a long, narrow head; dark eyes; short, pointed ears; long feet; and a long tail which is carried low. The male is from about 28 to 31 inches in height at the shoulder and weighs from 75 to 105 pounds; the female is somewhat smaller and weighs about 20 pounds less. The borzoi has great speed and courage, and makes a gentle pet.

BOS. See Cattle.

BOSANQUET, Bernard (1848–1923), English philosopher, born at Rock Hall, Alnwick, and educated at Oxford. From 1871 to 1881 he lectured at University College, Oxford; and from 1903 to 1908 was professor of moral philosophy at St. Andrews University. Among his works are *Philosophical Theory of the State* (1899), *Value and Destiny of the Individual* (1911–12), *Implication and Linear Inference* (1920), and *Three Chapters on the Nature of Mind* (1923).

BOSCH or **BOS,** Hieronymus (about 1450–1516), painter of early Netherlands school, born at 's Hertogenbosch (Bois-le-Duc). His real name was Hieronymus van Aeken. He is especially known for visionary representations of the infernal regions, and other gruesome subjects depicted with grotesque humor. Spain has the largest number of his paintings. The former royal palace at Ayuda, Lisbon, contains his most copied "Temptation of St. Anthony". Princeton University museum has his "Christ before Pilate" and "Adoration of the Magi".

BOSCH, Hieronymus de (1740–1811), Dutch poet and philologist, born in Amsterdam. He served as curator of Leyden University, and was one of the founders of the Dutch Institute of Science and Art. His *Poemata* (1803), a collection of poems in Latin, established his reputation as a poet. He edited *Anthologia Græca* (4 vols., 1795–1810), containing a previously unpublished metrical translation by the celebrated Dutch jurist, Hugo Grotius (q.v.). He was also the author of a number of scholarly papers on literary subjects.

BOSCH, Karl (1874–1940), German industrialist and chemist, born at Cologne and educated at the University of Leipzig. In 1899 he was employed by the Badische Anilin und Soda Fabrik. He became director in 1914 and general director in 1919, during the period when this corporation was becoming one of the largest chemical manufacturers in the world. In 1925, after B.A.S.F. had absorbed most of the other large German chemical firms and had become an enormous cartel called I.G. Farbenindustrie, Bosch became general director of I.G.F. He later became chairman of the board of I.G.F., a post he held until his death.

Bosch is best known for his commercial adaptation of Haber's process for the syn-

thesis of ammonia, an achievement for which he received half of the 1931 Nobel Prize in chemistry. This process, which had previously been workable only on a laboratory scale, was developed by Bosch to the point of large-scale industrial production. See NITROGEN FIXATION.

BOSE, SUBHAS CHANDRA (1897–1945), Indian Nationalist leader, born in Cuttack, Bengal, and educated at Scottish Church College and at Cambridge University, England. In 1921 he participated in the civil disobedience campaign initiated during the preceding year by Mohandas Gandhi (q.v.) and was imprisoned by the British for his activities. He was a radical Socialist, and figured prominently in Indian politics between 1924 and the outbreak of World War II. Bose held several public offices and served as one of the two general secretaries of the All-India National Congress, a political organization representing all classes of Indians and opposed to British rule. Throughout this period he led, along with Jawaharlal Nehru (q.v.), the left-wing opposition to Gandhi's policies in the Indian liberation movement. On various occasions he was sentenced to jail terms for his activities in behalf of Indian independence. As a result of major disagreements with Gandhi he resigned as president of the All-India National Congress in 1939, and organized the Forward Bloc, a group which rapidly came under the influence of German and Japanese agents after the outbreak of World War II. Bose served another term in jail in 1940 because of his anti-British activities. The next year he succeeded in reaching Germany, where he made frequent radio speeches to the Indian people, urging them to support Germany and Japan as the best way to gain their freedom from British rule. Arriving in Tokyo in 1943, he continued his activities as an enemy propagandist. In Singapore later that year he announced the formation of the National Indian Freedom Movement, designed to win independence from Great Britain. During 1944 he aided the Japanese military effort in Burma, commanding a force of about 30,000 Indian troops which he recruited in Japanese-occupied territory.

BOSJESMAN. See BUSHMAN.

BOSNIA AND HERZEGOVINA, constituent republic of the Federal People's Republic of Yugoslavia, situated in the central part of the country. The N. portion of the republic is a region of flat, fertile plains; the remainder is extremely mountainous. An extension of the Dinaric Alps is the chief uplift, with elevations up to 8000 ft. Climatic conditions in the lowland region are generally mild; in the highlands the climate is subtemperate. The chief rivers of the repubic are the Sava, which flows along the N. frontier, and the Una, Drina, and Vrbas, tributaries of the Sava. The Una, the Vrbas, and the upper course of the Drina are unnavigable. Among the principal cities of the republic are Sarajevo, the capital; Mostar; and Banja Luka. The population consists mainly of Serbians and Croats. Other national groups included are Turks, Greeks, and Gypsies. Serbo-Croatian is the language used by most of the people. Other languages include German and Turkish. The largest religious body in the republic is the Orthodox Church; the chief minority bodies are Mohammedan and Roman Catholic.

Bosnia and Herzegovina is rich in natural resources, including large tracts of arable land, extensive stands of timber, and valuable deposits of such minerals as salt, manganese, silver, lead, copper, iron, chromium, and coal. The principal industry of the republic is agriculture, especially cattle raising and the growing of wheat, potatoes, hay, and raisin grapes. Mining and forestry rank next in importance. The leading manufacturing industries are beet-sugar refining, tanning, and the production of textiles, iron products, and carpets and rugs.

History. In antiquity the territory comprising present-day Bosnia and Herzegovina formed part of Illyria and, later, of the Roman province of Illyricum. The territory was overrun by the Goths after the collapse of the Roman Empire. About the beginning of the 6th century it was occupied by Slavs. Various parts of the territory were held by princes during the next few centuries. About 1100, after a brief period of Croatian rule, the Bosnian part of the territory became a dominion of Hungary. The Hungarians later made Bosnia a banate (province) and placed it under the control of an official known as a *ban.* Bosnian independence from Hungarian overlordship was effected during the reign (1180–1204) of Ban Kulin. However, in 1254 the Hungarian king Bela IV re-established suzerainty over the banate. The next ban of note was Stephen Kotromanić, who ruled from 1322 to 1353. He extended Hungarian authority over the principality of Hum (or Zahumlje), which later became known as Herzegovina. Kotromanić's nephew and successor Stephen Tvrtko further extended the boundaries of the banate. In 1376 he pro-

Near East College Association

The Bosporus, seen from a tower in the old city of Istanbul

claimed himself the king of Serbia and Bosnia.

The kingdom began to disintegrate after Tvrtko's death (1391). In 1398 the Turks made the first of a long series of attacks on the kingdom. A rebellious Bosnian chieftain seized the Hum region early in the 15th century and established it as *Herzegovina* ("independent duchy"). By 1463 the Turks had conquered all of Bosnia, and Herzegovina fell to them in 1483. The two nations remained Turkish provinces for the next four hundred years. Unsuccessful uprisings against the Turks occurred frequently in Bosnia and Herzegovina during the 19th century.

By the terms of the Treaty of Berlin, the peace agreement which ended the Russo-Turkish War of 1877–78, the victorious Russians authorized Austria-Hungary, as a reward for its neutrality during the war, to occupy and administer Bosnia and Herzegovina. The two provinces were annexed by Austria-Hungary in 1908. Under Austrian rule Bosnia and Herzegovina were centers of nationalist agitation for political independence and cultural autonomy. On Dec. 1, 1918, following the overthrow of the Austro-Hungarian monarchy at the close of World War I, Bosnia and Herzegovina were merged and became part of the independent Kingdom of the Serbs, Croats, and Slovenes (later the Kingdom of Yugoslavia). With the formation of the Federal People's Republic of Yugoslavia, on Nov. 29, 1945, Bosnia and Herzegovina became one of six equal, federated republics of the new state. See YUGOSLAVIA. Area of republic, 19,904 sq.m.; pop. (1953) 2,843,486.

BOSPORUS or, occasionally but incorrectly, **BOSPHORUS** (Turkish, *Karadeniz Boğazi;* anc. *Bosporus Thracius*), strait connecting the Black Sea and the Sea of Marmara and separating Turkey in Asia from Turkey in Europe. It is about 20 m. long, varies from about ½ m. to 2¾ m. in width, and has a maximum depth of almost 400 ft. Navigation of the strait is rendered difficult by swift surface currents. Along both shores are many scenic attractions, including ancient ruins, picturesque villages, and forested areas. Near the s. end of the strait is the Golden Horn (Istanbul harbor), one of the most commodious natural harbors in the world.

In Greek mythology the Thracian Bosporus

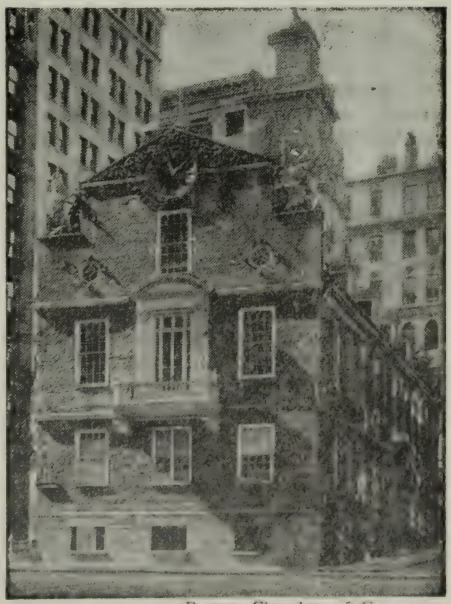
is the "ford of the Ox", so called from the story of the goddess Io, who, transformed into a heifer, swam across it. Almost all of the commerce moving between the Mediterranean and Black Sea regions was routed through the strait in ancient and medieval times, and it is still an important artery of international trade. For international agreements regarding the use of the Bosporus, see DARDANELLES AND BOSPORUS STRAITS.

BOSQUET, PIERRE JEAN FRANÇOIS (1810–61), French soldier, born in Monte de Marsan, Landes, and educated at Polytechnic School, Paris. He was commissioned a sublieutenant of artillery in 1833. On duty in Algeria from 1834 to 1853, he distinguished himself in numerous campaigns and attained the rank of general. Following the outbreak of the Crimean War (1854–55) he received command of the 2nd Division. His troops were largely responsible for the Anglo-French victories at the Alma R. (Sept. 20, 1854) and at Inkerman (Nov. 5). Severely wounded during the assault (Sept. 8, 1855) on the Malakhov, one of Sevastopol's key defense bastions, Bosquet was compelled to retire from active service. He was appinted to the Senate and made a marshal of France in 1856.

BOSSUET, JACQUES BÉNIGNE (1627–1704), French Roman Catholic clergyman, born at Dijon and educated at Jesuit schools and at the College of Navarre, Paris. He was one of the greatest of French pulpit orators. He was tutor to the Dauphin, for whom he wrote *Discours sur l'Histoire Universelle jusqu'à l'Empire de Charlemagne* (1681), notable as the first attempt at a philosophical treatment of history. Bossuet was noted for the part he played in the quarrel between King Louis XIV and the papacy regarding the respective rights of king and pope in France. In 1682 Bossuet drew up a *Declaration of the French Clergy* which leaned to the king's side of the controversy and became the basis for subsequent claims of king and church in France for independence from the papacy. Bossuet also engaged in a famous controversy with François de Salignac de la Mothe-Fénelon on the subject of quietism (q.v.); Fénelon supported this religious philosophy and Bossuet considered it heresy. Bossuet was the eventual victor in this dispute. Among his writings are a number of funeral orations, including those he delivered at the funerals of Henrietta Maria, widow of Charles I of England, and the great French general, Condé; and *Histoire des Variations des Églises Protestantes* (1688).

BOSTON, capital of Massachusetts, county seat of Suffolk Co., and largest city in population in New England, situated on Boston Bay, an arm of Massachusetts Bay, at the mouths of the Charles and Mystic rivers and about 232 m. by rail N.E. of New York City. Boston is the ninth-largest city in population (1950) in the United States, a major seaport, and the commercial, financial, industrial, and cultural center of New England. The adjoining region, with almost 100 cities and towns, is one of the principal industrial areas of the United States. Together with 37 of the nearby communities, the city forms the Boston Metropolitan Area. The water supply, sewage disposal, and parks and boulevards of the Metropolitan Area are managed by the Metropolitan District Commission, a State agency created in 1919.

The original site of Boston was a peninsula of less than 800 acres in area, dominated by three hills, surrounded by tidal marshes, and deeply indented by coves, creeks, and inlets. A narrow neck, 1 mile in length and so low that it was not infrequently submerged, joined the peninsula to the mainland. The inlets, coves, and tidal marshes were gradually filled in, increasing the original area to 1801 acres. Part of this section is now the site of the Back Bay district of the modern city. The limits of the original town were extended at various



Boston Chamber of Commerce

The Old State House in Boston

Boston Chamber of Commerce

Tremont Street, seen from Boston Common, in a busy shopping district of Boston

periods to include Noddle's Island, afterward named East Boston; Dorchester Neck, annexed in 1804, now South Boston; Washington Village, separated from Dorchester in 1855; Roxbury, annexed in 1867; Dorchester, in 1869; Charlestown, West Roxbury, and Brighton, in 1873; and Hyde Park, in 1912. The area of the city is now 30,295 acres (about 44 sq.m.).

Historical Sites. The characteristics of the original town are still evident in the narrow and irregular streets of the North End. There are a number of famous landmarks. Old South Meeting House, constructed as a church in 1669 and rebuilt in 1729, was the scene of several notable pre-Revolutionary rallies, including the rally that led to the Boston Tea Party. The building is now a historical museum. Another famous old church is Old North Church (also called Christ Church), built in 1723. From the steeple of this edifice was flashed, on the night of April 18, 1775, the signal informing the American patriot Paul Revere of the route taken by the British force dispatched against Concord. The Old State House, dating from 1748 and subsequently restored, overlooks the scene of the Boston Massacre. A number of historic documents, notably the Declaration of Independence, were read from its balcony. Other buildings of historical importance are the Paul Revere House (1660), the oldest house in the city and after 1770 the home of the patriot; Faneuil Hall (q.v.), known as the "Cradle of Liberty" because it was a center of pre-Revolutionary activity, and King's Chapel, an 18th-century edifice on the site of the first Episcopal Church in New England. Bunker Hill Monument, a granite obelisk, 221 ft. in height, stands in Charlestown on Breed's Hill, site of the heaviest fighting in the historic Battle of Bunker Hill.

Public Park System. The Common, covering an area of 48 acres, and the best-known unit of the city park system, was marked off in 1634 as a common ground and has since been maintained for public use. Near the Tre-

mont Street (Lafayette) Mall on the Common stands the Crispus Attucks Monument, commemorating the leader of the patriots killed in the Boston Massacre. Adjacent to the Common is the Public Garden (24 acres), the entrance to the Back Bay district. The Metropolitan Parks district comprises such reservations as Blue Hills (4900 acres); Middlesex Fells (2150 acres); Stony Brook Woods (460 acres), which connects the Blue Hills reservation with the Boston municipal system at the Arnold Arboretum and Museum, noted for its collection of trees and shrubs; Lynn Woods (2000 acres); Beaver Brook and Waverley Oaks Reservation (58 acres); Revere Beach (67 acres); Nantasket Beach (25 acres); and park areas along the Charles, Mystic, and Neponset rivers. The Metropolitan system includes reservations and parkways covering approximately 12,800 acres.

Schools, Libraries, and Museums. Boston's public-school system, the oldest in the United States, includes kindergarten, primary, grammar, and high schools; special high schools of the mechanic arts, the practical arts, and commerce; girls' (and boys') trade schools; girls' (and boys') Latin schools; and a Teachers' College. The oldest public school in the city is Boston Latin School, founded in 1635; Roxbury Latin School, founded in 1645, is the oldest privately endowed secondary school. English High School, established in 1821, is the oldest high school in the United States. Among the institutions of higher learning are Boston University, several divisions of Boston College, the Medical, Dental, and Business schools of Harvard University, Tufts College Medical School, Emerson College, Emmanuel College, Simmons College, Northeastern University, Suffolk University, St. John's Boston Ecclesiastical Seminary, the Massachusetts College of Pharmacy, Teachers College of the City of Boston, the New England Conservatory of Music, the School of the Boston Museum of Fine Arts, and the Massachusetts School of Art.

The Boston Public Library, a world-famous institution, was founded in 1852; it contains nearly two million volumes and maintains over thirty branches with large permanent collections. Among other noted libraries in the city are those of the American Academy of Arts and Sciences (founded 1780), the Boston Athenaeum (founded 1807), Boston Library Society, Congregational Library, Massachusetts Historical Society (founded 1791 and the oldest historical society in the United States), Massachusetts Horticultural Society (founded 1829), New England Historic Genealogical Society (founded 1844), Massachusetts State Library, Social Law Library, General Theological Library, and Natural History Society, as well as those of the leading educational institutions. More than five million volumes in public and private libraries are available within a 15-mile radius of the center of the city.

Boston and its immediate environs are richly endowed with museums. The Boston Museum of Fine Arts (q.v.) contains the largest collection of prints in the country and rare collections of Oriental and ancient Egyptian art objects. The Boston Museum of Science (formerly the Museum of Natural History) is one of the most modern institutions of its kind in the world. The Peabody Museum of Archeology and Ethnology, at Harvard University, Cambridge, Mass., is internationally famous.

Various musical societies are maintained in Boston, notably the Boston Symphony Orchestra (q.v.). Founded in 1881, it ranks among the foremost musical organizations in the United States.

Modern Buildings. The State House, capitol of Massachusetts, occupies a site on Beacon Hill, in the central part of the city. Most of this building is of modern construction, but its front portion was designed by the American architect Charles Bulfinch and erected between 1795 and 1798. Prominent among other public buildings in the city are Boston City Hall, a structure in the Italian Renaissance style; City Hall Annex, completed in 1914; Suffolk County Court House, a fifteen-story structure erected in 1938; and the U.S. Custom House, surmounted by a tower nearly 500 ft. in height. Nearby is the new twenty-two story Federal Building, which covers an entire city block and houses the post office, subtreasury, and United States courts.

Copley Square, in the Back Bay, is the site of several noteworthy edifices. Among them are the Boston Public Library, the Copley-Plaza Hotel, and Trinity Church on the south side, and the New Old South Church and the Wesleyan Building on the north side.

Trinity Church, designed by the American architect Henry Hobson Richardson, is a magnificent example of Romanesque architecture. The First Church of Christ Scientist is the largest ecclesiastical edifice in the city. Other notable buildings in the Back Bay are the John Hancock Insurance Building; the building of the New England Mutual Insur-

ance Co.; and the buildings of the Massachusetts Historical Society, the New England Conservatory of Music, and the Museum of Fine Arts. Wentworth Institute, Simmons College, and the Harvard Medical and Dental schools are in the same district. Harvard Medical School, comprising a group of five white-marble structures, is surrounded by a number of hospitals, mainly of white-marble construction. On the Charles River Esplanade is the new building of the Boston Museum of Science.

Commerce and Industry. Boston is the terminus of the Boston and Maine, the New York, New Haven and Hartford, and the Boston and Albany railroads. Two stations are situated on opposite sides of the business district, namely the new North Station of the Boston and Maine Railroad, and the South Station of the Boston and Albany and the New York, New Haven and Hartford railroads. There are also extensive subway and elevated systems; the former was placed in operation in 1897 and the latter in 1901.

Since 1840, when Boston was chosen as the American terminus of the Cunard Line, it has had direct steamship lines to Europe, and in recent years has had shipping connections with other parts of the world. The city's shipping and port facilities are concentrated mainly between South Boston and Charlestown. More than 40 m. of side wharfage is located in this area. Commonwealth Pier in South Boston, a structure 1200 ft. long and 400 ft. wide, was completed in 1913, at a cost of $4,500,000. Also in South Boston is one of the world's largest dry docks. Other facilities include the world's largest fish-handling pier, the U.S. Navy Yard in Charlestown, and ship-repair plants in East Boston and Chelsea. In East Boston, bordering the harbor, is the Logan International Airport, covering an area of 2200 acres. A vehicular tunnel and a recently constructed double-level bridge facilitate travel between central Boston and Logan Airport.

Large-scale foreign trade is carried on through the Massachusetts Customs District (Boston and eight minor ports). Approximately sixty steamship lines serve the District. Imports average about $315,000,000 in value annually; exports, about $70,000,000 annually. Boston is the foremost fishing port on the Atlantic seaboard, and annually distributes one third of the fresh and frozen-fish products of the United States. One of the largest wool-trading centers in the country, Boston receives more than half of the nation's raw-wool imports. The city is also the foremost distributing center of the shoe and leather industries.

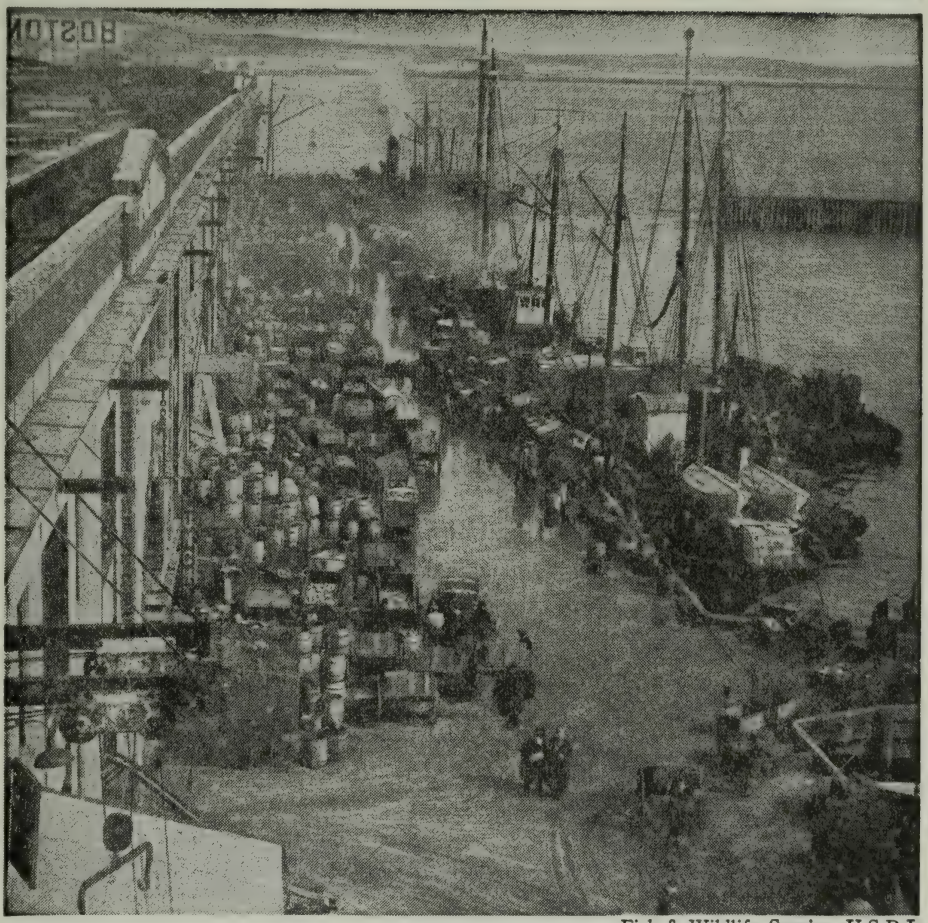
About 6500 factories are located in the Boston Industrial District (including 132 nearby cities and towns). These factories employ about 380,000 persons. The products manufactured are valued at about $4,250,000,000 per year. In the Boston Industrial District are 63 percent of the manufacturing plants of the State of Massachusetts and about 35 percent of all the factories of New England. Manufacturing is highly diversified. The District ranks high in the nation in the production of machinery, leather and food products, apparel, paper and rubber goods, and safety razors and blades and other metal products. Sugar refining, shipbuilding, printing and publishing, and textile manufacturing are also important industries.

The Federal Reserve Bank of the First District is located in Boston, and the city ranks first in the nation in the volume of business handled by investment trusts. On a per capita basis, savings deposits in Boston banks are nearly three times the average for the country as a whole. The city ranks third in the nation in the volume of insurance business handled.

Population. The growth of the city of Boston has been gradual and steady, as indicated by the following population figures: 1790, 18,320; 1800, 24,937; 1850, 136,881; 1870, 250,526; 1890, 448,477; 1900, 560,892; 1910, 670,585; 1920, 748,060; 1930, 781,188; 1940, 770,816; 1950, 790,863.

Government. The city is governed according to the provisions of the charter of 1919, as subsequently amended. Executive authority is vested in a mayor elected for a term of four years. Legislative authority is vested in a city council. Under the provisions of an amendment that became effective in 1951, the city council, formerly consisting of a representative from each of the city's twenty-two wards, is composed of nine members elected at large for two-year terms. Another amendment effective in 1951 provides for primary elections for the offices of mayor, city councilor, and school committeeman. Any registered voter is eligible for elective office.

History. The peninsula which became the site of Boston was known to the Indians as Shawmut. An exploring party from Plymouth visited the peninsula in 1621. In July, 1630, a group of the colonists brought to Salem by John Winthrop, first governor of Massachusetts Bay Colony, founded Charlestown and named the peninsula Trimontaine ("three



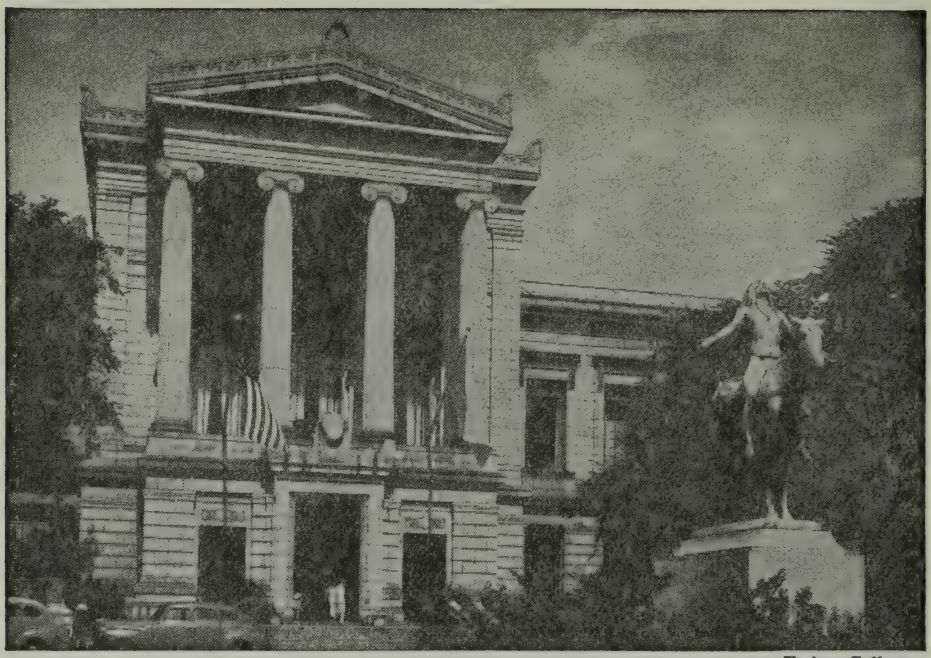
Fish & Wildlife Service, U.S.D.I.

Boston Fish Pier, one of the largest of such piers in the world

hills"). Winthrop and the greater part of his group moved to Trimontaine on Sept. 17, 1630. On that date the place was renamed Boston, after the Lincolnshire town from which many of the colonists had come. The old name, changed to Tremont, is now the name of a city street. On Oct. 19, 1630, the first General Court (legislature) of Massachusetts Bay Colony met at Boston, and in 1632 the town was made the capital of the colony.

Early in 1632 the first meetinghouse was erected, near the head of what is now State Street, and three years later the first free schoolhouse was built on what is today School Street. The first grand jury in the history of the country met in Boston in 1635. Boston soon became the chief town of the Massachusetts Bay Colony and the center of Puritan religious life and learning. In 1636 the intolerant and austere religious code prevailing in the city brought on the Antinomian controversy (see ANTINOMIANISM; HUTCHINSON, ANNE). The ensuing dissension led to the emigration of many prominent citizens. Four women were executed in Boston for witchcraft between 1648 and 1688. Between 1659 and 1661 four Quakers were hanged for returning after being exiled.

A post office was opened in 1639. In 1686 the first bank in Boston, also the first in the American colonies, was chartered. A printing office was opened in 1674, and in 1704 publication of the *Boston News-Letter*, the first newspaper to be printed in America, was begun. At that time Boston was the largest and most important town in America.



Ewing Galloway

The Boston Museum of Fine Arts

The citizens of Boston took a leading part in the pre-Revolutionary conflict between the colonies and Great Britain. The impressment of seamen by the British government in 1747 caused several riots in the city. Oppressive British legislation, notably the Stamp Act (1765), and later the revenue acts, incited outbreaks, which led to the quartering of two British regiments in Boston. On March 5, 1770, occurred the incident known as the Boston Massacre (q.v.). The famous "Boston Tea Party" (q.v.) of Dec. 16, 1773, caused Parliament to pass the Boston Port Bill (q.v.). Boston was occupied by British troops after the skirmishes at Lexington and Concord, but was soon besieged by American troops. American attempts to fortify Charlestown were followed by the Battle of Bunker Hill (see BUNKER HILL, BATTLE OF), on June 17, 1775. By fortifying Dorchester Heights, the American commander in chief George Washington forced the British to evacuate the town on March 17, 1776.

After the Revolution Boston's prosperity was almost continuous; the most important interruption was caused by the Embargo Act of 1807. (See EMBARGO ACT.) The War of 1812 further hampered the maritime commerce of Boston, but the manufacturing industries of the town were expanded during the period of hostilities. Boston received its city charter in 1822; it then had a population of 47,000. The schism in the Congregational Church developed in Boston during the first part of the 19th century, and gave rise to the Unitarian movement in the United States. Another great American movement of the period had its inception in the city. In 1831 the journalist William Lloyd Garrison began in Boston the publication of *The Liberator,* the first antislavery periodical. The New England Antislavery Society, the first society to advocate immediate emancipation of Negro slaves, was organized in Boston by Garrison in 1832. Boston thus became the center of the abolitionist movement, though in 1835 there was an anti-abolitionist riot there. During the Civil War Boston provided more than 26,000 men for the Union army and navy.

Until the late 19th century, Boston was the literary center of the United States. Among the noted authors who lived in or about the city were Ralph Waldo Emerson, Nathaniel Hawthorne, James Russell Lowell, Henry Wadsworth Longfellow, Oliver Wendell Holmes, John Greenleaf Whittier, Henry David Thoreau, William H. Prescott, George Ticknor, George Bancroft, Francis Parkman,

and Richard H. Dana II. It was Holmes who referred, jestingly, in one of his *Autocrat* essays, to the Boston State House as the "hub of the solar system".

From its early days Boston has suffered greatly from fires. The most destructive occurred in 1676, 1679, 1711, 1760, 1872, 1889, 1893, and 1942. That of 1872 was especially disastrous, destroying property valued at over $60,000,000. The 1942 conflagration, in a night club fronting on Piedmont Street, took an official toll of 474 lives.

BOSTON COLLEGE, a Roman Catholic institution of higher education conducted by the Jesuits at Chestnut Hill, Massachusetts, a suburb of Boston. The college was founded in 1863 in Boston and moved to its present location in 1913. A branch was later opened in Boston and in 1938 a School of Business Administration was also located there. Boston College offers degrees in arts, science, business administration, social service, and theology. Evening, summer, extension, and graduate courses are coeducational; the college proper and theology courses are for men only. The total enrollment in 1953–54 was 7515, including 5058 full-time students; the faculty numbered 364.

BOSTON MASSACRE, designation applied to the fatal attack by British troops, on March 5, 1770, on a group of citizens of Boston (then in the British colony of Massachusetts Bay). Public resentment against the British policy of quartering troops in the city to discourage demonstrations against the Townshend Acts (q.v.) provided the background of the incident. The disorders culminated when nine British soldiers struck by missiles thrown during a demonstration fired into the crowd, killing three men and wounding seven more, of whom two subsequently died. All nine soldiers and their commanding officer were tried for murder. They were defended by John Adams and Josiah Quincy (qq.v.) and

Metropolitan Museum of Art

Old engraving by Paul Revere of the Boston Massacre, entitled "The Bloody Massacre"

were acquitted, although two were declared guilty of manslaughter and received light punishments. Some historians regard the incident as discreditable to the people and the soldiers alike and without any great historical significance; others regard it as the first incident of the American Revolution.

BOSTON MUSEUM OF FINE ARTS, one of the leading art museums of the United States, located in Boston, Mass. It was founded in 1870 and moved to its present quarters in 1908. Its collection of Oriental sculpture and painting is notable, and its collection of Japanese art is the finest in the world. The Museum houses one of the largest and most important collections of prints in the United States, as well as paintings by ancient and modern masters, tapestries, ceramics, metalware, old silver, and other art works. Among the paintings are canvases by important American artists, such as John Singleton Copley, Gilbert Stuart, Benjamin West, and Winslow Homer, and works by such European masters as Velasquez, El Greco, Rembrandt, Rubens, Renoir, Gauguin, and Van Gogh. In 1941 the museum established a provisional gallery for exhibitions of the work of living American artists.

BOSTON NEWS-LETTER, the first regularly published newspaper in America. It was issued as a weekly, for the first time on April 24, 1704, by John Campbell, postmaster of Boston. Campbell had been writing "newsletters" to Governor Winthrop of Connecticut. In 1704 he received official permission to publish *Boston News-Letter.* Under Richard Draper, who became the editor in 1762, the paper supported Britain in its differences with the American colonies. When Draper died in 1774 his widow continued the pro-British policy of *Boston News-Letter.* The paper was discontinued when she left Boston in the British evacuation on March 17, 1776. See NEWSPAPERS.

BOSTON PORT BILL, legislation passed by the British Parliament, and signed by King George III in March, 1774, designed to punish the people of Boston for their destruction of tea in Boston harbor on Dec. 16, 1773 (see BOSTON TEA PARTY), and scheduled to go into effect on June 1. Provisions of the bill included the virtual closure of Boston harbor to commerce, the removal of the seat of government of the Massachusetts Bay Colony to Salem, and the supplanting of Boston by Marblehead as a port of entry until the town of Boston had paid for the tea which was destroyed and had fulfilled other specified conditions. Widespread indignation was aroused and June 1 was observed as a day of fasting and prayer. A general congress—the first Continental Congress—was called to discuss the Boston Port Bill and other acts passed in the same year, and to devise measures for relief. The bill remained in effect until the outbreak of the American Revolution in 1775.

BOSTON SYMPHONY ORCHESTRA, one of the foremost orchestras in the world, established in Boston, Mass., in 1881, by the American banker Henry Lee Higginson (1834–1919). The orchestra was supported financially by Higginson until 1918, when it was incorporated and its control passed to a board of nine trustees. Its first conductor was Sir George Henschel, who served from 1881 to 1884. He was succeeded by Wilhelm Gericke (1884–89, 1898–1906), Arthur Nikisch (1889–93), Emil Paur (1893–98), Karl Muck (1906–07, 1912–18), Max Fiedler (1908–12), Henri Rabaud (1918–19), Pierre Monteux (1919–24), and Serge Koussevitsky (1924–49). Charles Münch was appointed conductor in 1949. In addition to its regular season of concerts, the orchestra gives in Boston a spring series of popular concerts (May–June), known as the Boston "Pops" and first presented in 1885, and a series of free, open-air concerts on the Charles River Embankment (July). In 1936 the Boston Symphony Orchestra with Serge Koussevitsky as conductor was engaged to play regularly at the Berkshire Festivals (q.v.). The orchestra's concerts there, suspended during World War II and resumed in 1946, are among the most notable summer musical events in the United States.

BOSTON TEA PARTY, popular name for the action taken on Dec. 16, 1773, by a group of Boston citizens in protest against the principle of "taxation without representation", as exemplified in a tax placed on tea by the British Parliament. Three British ships with 342 chests of tea, valued at £18,000, were anchored in Boston harbor. By Massachusetts law, the ships could not leave the harbor without discharging their cargo, and a deadlock ensued. On the evening of Dec. 16, a group of prominent Bostonian patriots, disguised as American Indians, boarded the vessels and emptied the cargo of tea into Boston harbor. Upon refusal of the government of Boston to pay for the tea, the British government closed the port. See BOSTON PORT BILL.

BOSTON TERRIER, a nonsporting terrier, originated by crossing the English bulldog with the white English terrier. The Boston

terriers now known in America, and only recognized as a distinct breed in 1893, are descended from a dog owned (about 1884) by a native of Boston, Mass., hence the name. The Boston terrier is a small dog, weighing about 15 to 25 pounds. It has a square, flat skull; large, round, dark eyes that are alert and intelligent; a coat that is smooth and fine-textured, and usually brindle in color with white markings, or black with white markings; a short, square muzzle; small, thin ears; a wide chest; sloping shoulders; and a short, tapering tail. The Boston terrier is lively, intelligent, strong, and active. Its unusually gentle disposition makes it an ideal pet.

BOSTON UNIVERSITY, coeducational institution, situated in Boston, Mass., organized in 1839 and chartered by the Massachusetts legislature in 1869. It comprises colleges of liberal arts, business administration, music, practical arts and letters, industrial technology, physical education, and general education; schools of education, medicine, law, theology, social work, nursing, public relations and communications; and a graduate school. In 1954 enrollment was 16,214, including 8674 full-time students; the faculty numbered 1350; and the library contained about 390,0000 volumes.

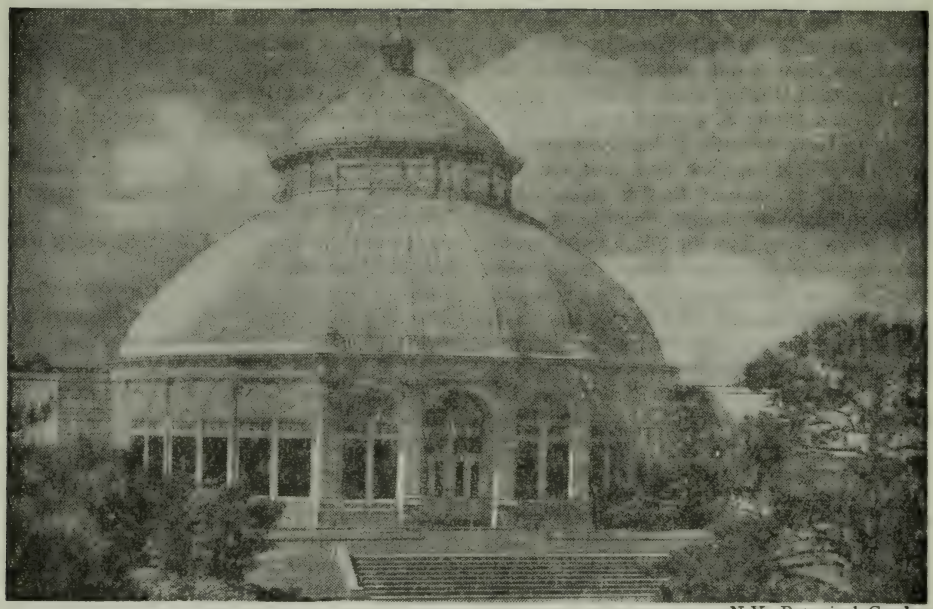
BOSWELL, JAMES (1740–95), Scottish writer, born in Edinburgh, and educated at Glasgow and Edinburgh universities and at the University of Utrecht. Persuaded by his father, a Scottish jurist, to study law, Boswell was admitted to both the Scottish and English bars, but never devoted himself to the active pursuit of a legal career. His legal training is reflected in some of his early writings, most notably in *Essence of the Douglas Cause* (1767), an account of a Scottish law suit. His other early works include *An Account of Corsica* (1768), a sympathetic study of that island's struggle for independence, written after an extended tour of the Continent. During this early period, Boswell established a personal relationship with the English man of letters Samuel Johnson. He first met Johnson as early as 1763, and from 1772 until Johnson's death in 1784 the two men were in close association with each other. In 1773 Boswell was admitted to Johnson's circle, which included such contemporary English notables as the statesman Edmund Burke, the author Oliver Goldsmith, the painter Sir Joshua Reynolds, and the actor David Garrick. Thereafter Boswell devoted much of his time to the compilation of detailed records of Johnson's activities and conversation. His accounts covered periods of daily association with Johnson in London, and also described a trip which the two friends made to Scotland and the Hebrides in 1773. After Johnson's death Boswell's *Journal of a Tour to the Hebrides* (1785) and *Life of Samuel Johnson* (1791) were published. The latter, the work for which Boswell is best known, is generally considered a masterpiece of biography. In 1927 an extensive collection of his letters, notes, and journals was discovered in Ireland. Yale University acquired these papers in 1949, and under its auspices they were prepared for publication. The first volume, *Boswell's London Journal,* appeared in 1950; subsequent volumes were *Boswell in Holland* (1952) and *Boswell on the Grand Tour* (2 vols., 1953 and 1955).

BOSWELLIA, a genus of trees of the family Burseraceae, found in the tropical portions of E. Africa and of India. Many of these trees yield valuable resins, the most noted of which is olibanum, the frankincense of the ancients. The olibanum of modern commerce is obtained from *B. carteri,* principally in Arabia. *B. serrata* is the salai tree of E. India and yields gugal, a resin similar to olibanum. *B. frereana* of E. Africa yields a resin called African elemi. The various species are large timber trees with pinnate leaves, each leaf containing about 21 hairy, serrated, oblong leaflets from 1 to 1½ in. long. The pale pink flowers are small and numerous, in axillary racemes.

BOSWORTH FIELD, BATTLE OF, an historic battle fought on August 22, 1485, in Leicestershire, England. The battle was of great political importance since it terminated the Wars of the Roses, a protracted struggle for the English throne (see ROSES, WARS OF THE). Rebel forces, numbering about 5000, commanded by Henry Tudor, Earl of Richmond, head of the house of Lancaster, defeated an army of about 15,000 men, led by King Richard III. About 100 of Tudor's men and several hundred of Richard's were lost. Treachery among the king's troops contributed to Tudor's victory. Richard III was killed in the fighting, and when he fell Sir William Stanley, a disloyal lieutenant of his, retrieved the royal crown and placed it on Tudor's head, proclaiming him king. At official ceremonies several weeks later, Tudor became King Henry VII. The battlefield is located on high ground near the market town of Bosworth (also called Market Bosworth), about 12 miles W. of Leicester, England.

BOT. See BOTFLY.

BOTANIC GARDEN, a scientific and educational institution consisting chiefly of a collection of living plants, out of doors in



N.Y. Botanical Garden

In the New York Botanical Garden, Bronx Park, New York City

plantations, or under glass in greenhouses and conservatories. It usually includes, in addition, a collection of dried plants, or herbarium (q.v.), and facilities such as lecture rooms, laboratories, libraries, museums, and experimental or research plantations.

Plantations and conservatories may be arranged according to one or more of the subdivisions of botanical science. They may be systematic, arranged by plant classification; ecological, by relation to environment; or geographic, by region of origin. The larger botanic gardens often include plantations of special subjects such as rock gardens, water gardens, and wild-flower gardens, and also collections of horticultural groups produced by plant breeding, such as roses, tulips, or rhododendrons. A plantation restricted to exhibits of woody plants is an arboretum.

The earliest botanic garden of record was established in ancient Athens, about 340 B.C., by Aristotle, who placed his pupil Theophrastus in charge. In modern times most of the important cities of the Old World have botanic gardens, many of which began as gardens for the cultivation of *simples,* or medicinal plants. The oldest such gardens are those established at Pisa, Italy, in 1543, at Paris in 1635, at Tokyo in 1638, and at Berlin in 1679. The Royal Botanic Garden at Kew, England, perhaps the most important in the world, was begun in 1759.

Of more than 500 botanic gardens of note in the world, over 200 are in the U.S. The first of these was Bartram's Gardens, established in Philadelphia in 1728. The most important botanic gardens in the U.S. today are the Missouri Botanic Gardens, established at St. Louis in 1859; and the New York Botanical Garden (1895, in Bronx Park) and the Brooklyn Botanic Garden (1910), both in New York City.

BOTANY, the study of the plant, or vegetable, kingdom; together with zoology it makes up the science of biology. The distinction between plants and animals is vague as applied to microscopic organisms (see ANIMAL), and the term botany is often restricted to the study of the higher forms.

Taxonomy, the classification of plants, preceded all other aspects of botany by many centuries. Aristotle's *On Plants,* the *Materia Medica* of Dioscorides, and the writings of the elder Pliny mark the ancient period. It was in the 16th century that the history of modern taxonomy began, with the publication of "herbals", descriptive lists of wild and cultivated plants, often accompanied by rough wood cuts. The method of independent observation of plants themselves has been ascribed to Otto Brunfels (1488?–1534) of

Strasbourg, whose *Kräuterbuch,* describing the common plants of Germany, was published in 1537. Other important botanists of this period were a German, Hieronymus Bock (1489?–1554) who called himself Tragus; a Swiss, K. von Gesner (q.v.); a Dutchman, Rembert Dodoens or Rembertus Dodonæus (1517–85) whose *Cruydeboek* described Dutch and foreign plants; an Englishman, William Turner (1510–68), whose *Newe Herball,* published in 1551, was the first scientific botanical work of British origin; and an Italian, Andrea Cesalpino (1519–1603). Botanic gardens (q.v.) were started in many countries at about the same time.

The use of the microscope in the 17th century, particularly by A. van Leeuwenhoek and M. Malpighi (qq.v.), made possible the study of plant physiology and anatomy. This work was carried on by Nehemiah Grew and Robert Hooke (qq.v.), and culminated in 1727 in the *Vegetable Staticks* of Stephen Hales (q.v.), regarded as the first modern work on plant physiology. Meanwhile the systematic classification of plants was progressing. Cesalpino had classified into 15 groups the 1520 plants which he described. Improved attempts, more nearly approaching a natural system, were published by the Scottish botanist Robert Morison (1620–83) in 1669, by John Ray (q.v.) in 1682, and by the French botanist Joseph Pitton de Tournefort (1656–1708) in 1700. Ray separated plants into flowering and nonflowering, and the flowering plants into monocotyledons and dicotyledons, distinctions still used (see *Classification,* below). Tournefort classified 8000 species into 22 groups. Although Linnæus made some use of these systems, his *Systema Naturæ* (1737) and other works, which

LOWER PLANT FORMS. *Left, top: Polypore fungus (phylum Thallophyta). Left, bottom: Red algae (phylum Thallophyta). Right: Ferns (phylum Pteridophyta).*

Canadian Pacific Steamships

TREES, MEMBERS OF THE PHYLUM SPERMATOPHYTA. *Left: Coconut palms, typical of the monocotyledonous angiosperms. Right: Branch and cones of a Douglas fir, a gymnosperm.*

founded the modern classificatory systems in both botany and zoology, were largely original. He separated plants into some 67 "orders", and further grouped the species within each order into genera. He also introduced modern "binomial nomenclature", now universally used, by which the scientific name of any organism consists of two words, both internationally accepted, the first being the name of the genus, the second the name of the species.

Linnæus is still the only botanist for whose name a single letter is universally recognized as an abbreviation, and many plants are still identified by the scientific names which he gave them; thus, the common daisy is "*Chrysanthemum leucanthemum* (L.)" in botanical works in every language. But the actual system of classification which he set up has been greatly modified. The modern system is largely based on that of A. L. de Jussieu as set forth in his *Genera Plantarum,* published in 1789. He laid down the principle that affinities are to be determined not by any single character, but by the sum of all; and he and his successors also pointed out that structure is more important than function in determining affinities. Thus, an aquatic plant may be more closely related to a terrestrial plant than to another aquatic species.

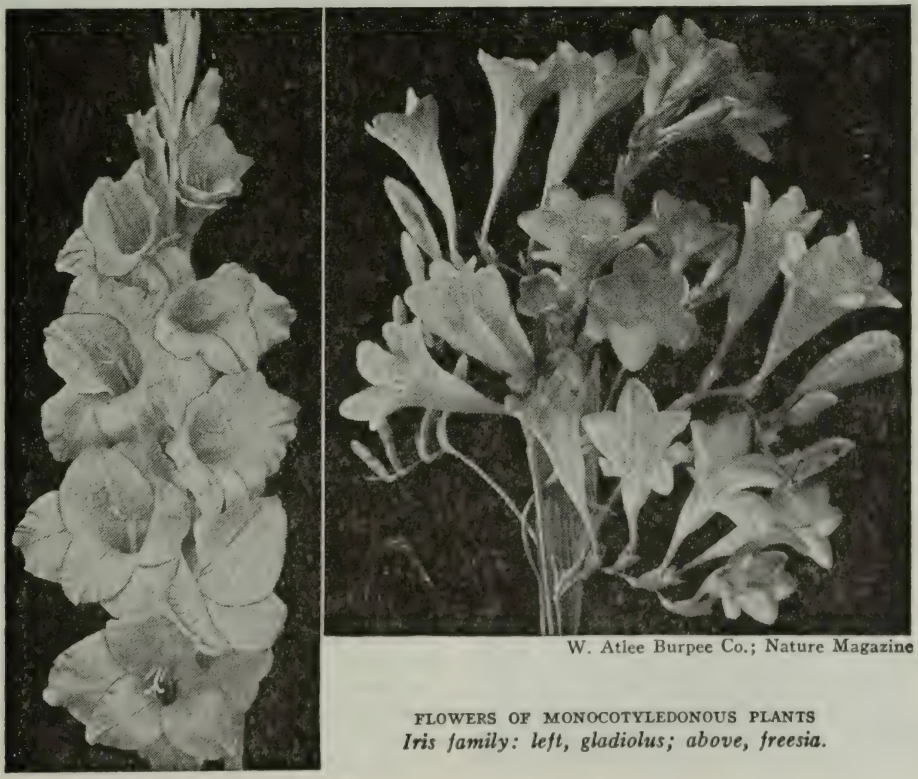
Among later botanists important in the history of taxonomy are A. P. de Candolle; Robert Brown, who showed the distinction between gymnosperms and angiosperms (see below); Wilhelm Hofmeister (1824–77), a German botanist who discovered the ovule (egg) in plants, and clarified the classification of nonflowering plants; Charles Darwin, whose *Origin of Species* (1859) showed the fundamental connection between classification and evolution; Karl Prantl (1849–93); and H. G. A. Engler, whose "sequence" is the basis of present botanical classification.

Classification. In the present system of classification, the plant kingdom is divided into four great groups, or phyla: (1) Thallophyta (algae and fungi, including bacteria); (2) Bryophyta (liverworts and mosses); (3) Pteridophyta (ferns, horsetails, and club mosses); (4) Spermatophyta (seed-bearing plants). Earlier authorities grouped the first three phyla together under the title Cryptogamia; some modern authorities separated the last three under the title Embryophyta, and split off a fifth phylum, the Myxophyta or slime molds.

The spermatophytes, which include all the common herbs, shrubs, and trees, are divided into two subphyla, Gymnospermae, with naked seeds, including the conifers and a few less important plants, and Angiospermae, the true flowering plants, with seeds borne in a closed ovary developing into a fruit. The angiosperms are again divided into Monocotyledoneae and Dicotyledoneae; the former have but a single cotyledon or nourishment-storing leaf in the ovary, while the latter have a pair. Moreover the structure of the stem is very different in these two groups, that of the dicotyledonous plants growing in thickness and adding annual rings. Typical members of the first group are grasses, lilies, and palms. Woody plants other than palms, and most herbs, belong to the Dicotyledoneae, which are further subdivided into Archichlamydeae, with calyx or corolla lacking or separated into distinct parts, and Metachlamydeae (also called Sympetalae or Gamopetalae), with corolla present and with the petals more or less united. There are about twelve orders (sometimes called series or cohorts) in the Monocotyledoneae, about 30 orders in the Archichlamydeae, and about 10 orders in the Metachlamydeae. These orders are further subdivided into families (formerly called natural orders). The names of orders usually end in *ales* and the names of families in *aceae*. Thus *Liliales* is the order of lilies, containing the lily family (*Liliaceae*), and also the iris family (*Iridaceae*), amaryllis family (*Amaryllidaceae*), rush family (*Juncaceae*), yam family (*Dioscoreaceae*), and six other families. Most of the families of flowering plants found in the U.S. are discussed in separate articles.

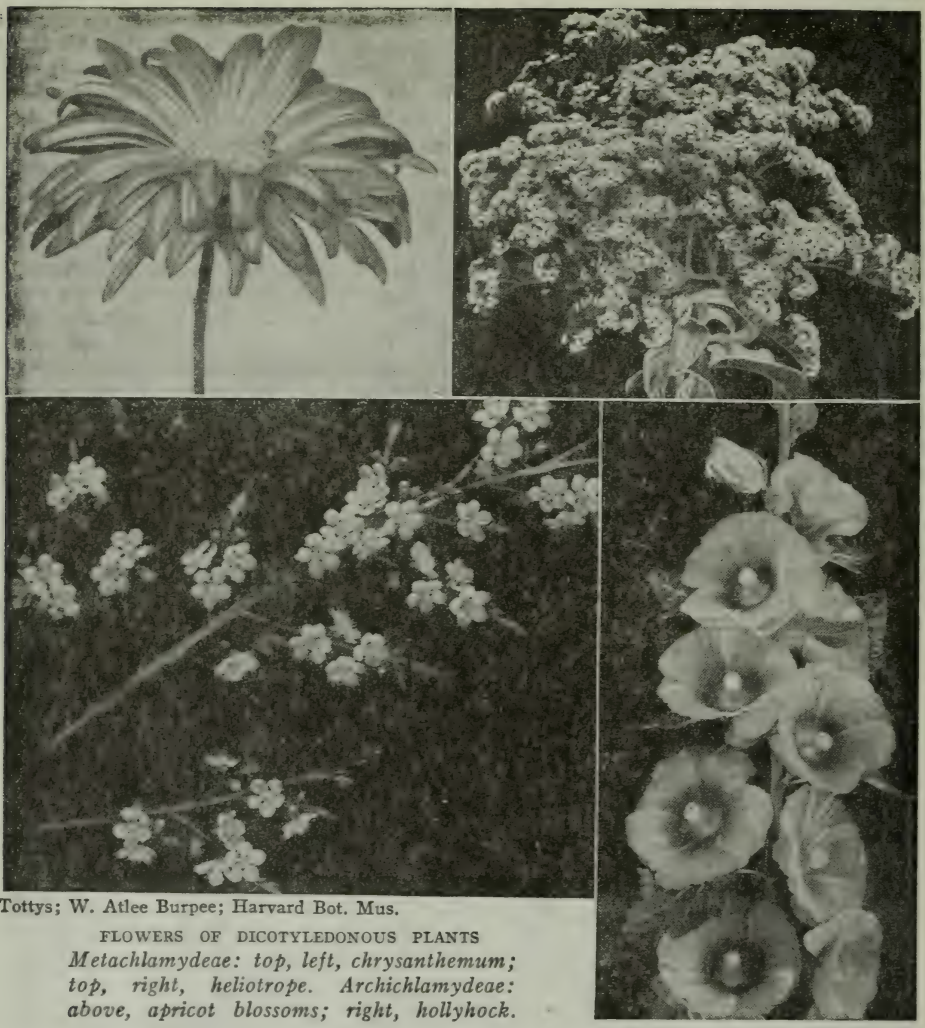
On the whole, modern botany is less concerned with classification of specimens than with the study of plants as living and functioning organisms. From the latter point of view the science, throughout its vast ramifications, subdivides into functional sciences identical with those of the animal kingdom, such as physiology, pathology, nutrition, and breeding.

Commercial Nomenclature. The American Joint Committee on Horticultural Nomenclature was formed in 1915 by committees of the American Association of Nurserymen and of the Ornamental Growers' Association. Its purpose was to "make buying easy" by bringing about the adoption of a single standardized



W. Atlee Burpee Co.; Nature Magazine

FLOWERS OF MONOCOTYLEDONOUS PLANTS
Iris family: left, gladiolus; above, freesia.



Tottys; W. Atlee Burpee; Harvard Bot. Mus.

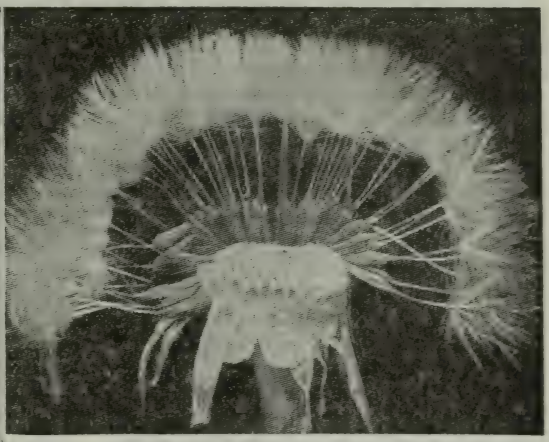
FLOWERS OF DICOTYLEDONOUS PLANTS

Metachlamydeae: top, left, chrysanthemum; top, right, heliotrope. Archichlamydeae: above, apricot blossoms; right, hollyhock.

common name for every tree, shrub, and plant in American commerce. Owing to the differing names under which plants were catalogued and distributed, plant buyers had been left in a state of bewilderment. In addition, there were two codes of botanical nomenclature in use among botanists—the American Code and the International, or Vienna Code. In 1917 the committee brought out its *Official Code of Standardized Plant Names*. Revisions and expansion of this work appeared in 1923 and 1941 as *Standardized Plant Names,* published at Salem, Mass., by the American committee.

Morphology. While from the historic standpoint taxonomy and classification deserve first mention, probably the most fundamental subdivision of botany is morphology, which treats of the structures of plants and their development, and upon the data of which taxonomy must build. Originally morphology dealt merely with the forms of mature plants and their organs; the former conception of organs was that everything about a plant could be referred to a very few categories, the favorite ones being root, stem, and leaf. Modern morphology is essentially an embryological subject, the purpose of which is to discover from developing structures every possible suggestion as to the relationships and origin of great groups. In such study the life history of a plant is traced from the single cell with which it starts to its mature form, and this life history at more than one point may give suggestions of relationships.

At the present stage of morphological progress, large problems, such as the origin of the great groups, still confront scientists. In a general way morphologists may be said to agree to the following statement: The *algae* represent the most primitive known forms from which the higher plants may be said to have been derived. The *fungi* are largely regarded as degenerate algae, which have made a certain amount of progress, but have de-



HOW PLANTS DISTRIBUTE THEIR SEEDS

Left: Broom-plant pods exploding, scattering seeds on surrounding ground. Above: Dandelion seeds are parachuted to new fields by the wind.

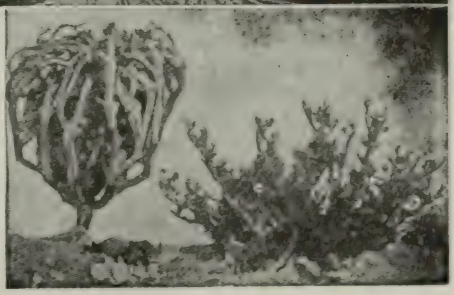
Dept. of Csvn. & Devel., N.C.; Harvard Bot. Mus.

ECOLOGY: PLANTS AND THEIR ENVIRONMENT

Above: Venus flytrap. Insects trapped and digested between the quick-closing leaves help feed the plant in poor soil.

Above, right: Cactus plants present less surface to the hot desert sun, minimizing the loss of water through evaporation.

Right: Rose of Jericho. Branches close in dry weather, open in damp, fitting the plant for the hazards of Arabian Desert life.



veloped no higher groups. The algae, therefore, represent the great ancestral group, and directly from them the liverworts have probably arisen. The liverworts have given rise to the mosses, and possibly also to the ferns. The ferns have come either through the liverworts or directly from the algae, and they have given rise to the seed plants. The study of fossil plants has shown that the fern plants very early gave rise to *Gymnosperms* (pines and their allies). See MORPHOLOGY OF PLANTS.

Anatomy. It was early observed that the bodies of the more complex plants consisted of layers of different constitution, but the real nature of the various structures was not determined until great improvements were made in the microscope in the latter half of the 17th century. Although the discovery was made that plant bodies are made up of cells of various forms, the study of cells and their development dates from 1840, following the researches of the German botanists Matthias Jacob Schleiden (1804–81), who first recognized the nucleus as a fundamental part of the cell, and Karl Wilhelm von Nägeli (1817–91), who investigated the growth of cells. Since that time plant anatomy has developed enormously, until now the recognized plant tissues are very numerous, and their origin and relation to one another in position and function are fairly well understood. Present practice among botanists tends to include plant anatomy under the general head of morphology of plants.

Cytology. In recent years another definite field of botanical research has been developed, which deals exclusively with the problems of the cell and is called cytology. It is related to anatomy in that it deals with cells, which in their aggregation form the tissues that are the subject of anatomy. At the same time it studies cells from the standpoint of morphology, since it is concerned with cell organs, their origin and mutual relationships; it also has its distinct association with physiology, inasmuch as the functions of its organs furnish the ultimate problem of the cell. Through cytological investigation the technique of research with the microscope has been greatly developed. The discoveries in methods of killing material, imbedding, sectioning, and staining have brought to view structures which were invisible to the observers of a few years ago. The principal problems of cytology at present are the structure and activities of protoplasm, the life history of plastids, the structure and function of the nucleus. Within the nucleus the attention of scientists has been particularly directed to the minute structure and behavior of the chromatin bodies (chromosomes), which appear at the time of cell-division and which are of outstanding importance in the problem of heredity, the cell wall, the development of the sex cells, fertilization, and the embryo. See CYTOLOGY.

Physiology. Not until the latter half of the 17th century was the science of plant physiology founded, long after the physiological significance of the human body was known. The foundation of all physiology is the direct observation of vital phenomena, and these must be evoked or altered by experiment. Vital phenomena in plants are essentially the same as they are in animals, but are often simpler.

The important general functions of plants, which furnish the subject matter for physiological research, are as follows: absorption of material and of energy from the outside world; transfer of water through the plant body, by which materials are properly distributed; transpiration, by means of which water is lost from the plant's surface; nutrition, including photosynthesis (the manufacture of carbohydrates), digestion (the conversion of foods into soluble form for transfer), and assimilation (the organization of protoplasm from food material); secretion; respiration, by means of which energy is liberated for the activities of the body; growth; and movement, which includes irritable responses to many stimuli.

For example, in the higher plants the root is an absorbing organ for water and soluble soil substances; in the root, stem, and leaves there are certain sets of vessels along which water and food materials travel readily; the leaves and the young stem surface are organs for the absorption and evolution of the carbon dioxide and oxygen, also giving off water by evaporation (transpiration), and being the principal organs for the manufacture of carbohydrate foods. Although these processes are distributed among the organs of a complex plant, they may all go on in one cell of the simplest plant. See PHYSIOLOGY: *Physiology of Multicellular Plants*; PHOTOSYNTHESIS.

Ecology. A phase of plant physiology which has recently come into prominence as an independent subject is ecology, also called bionomics, which deals with the mutual relations between plants and their environment. Certain phases of ecology, such as pollination, seed dispersal, protection, and symbiosis, have long been studied, and have been called plant biology. Three rather distinct lines of eco-

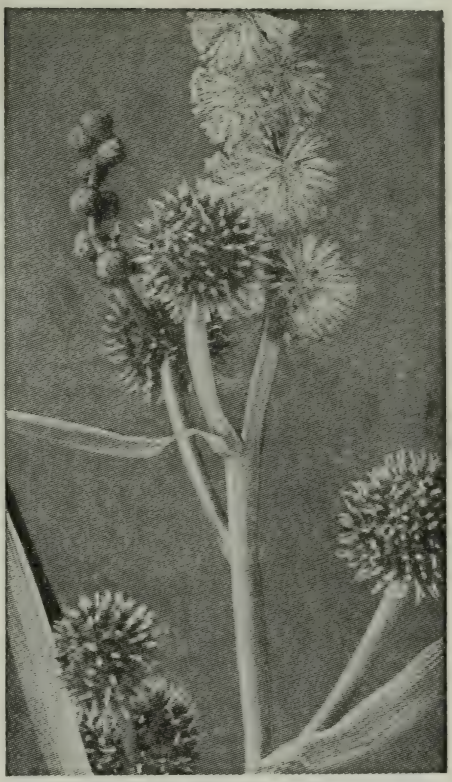
logical investigation have been developed. One deals with the reactions of plants, tissues, and organs to their environment, and may be called physiologic ecology. A second line has to do with the origin, development, and life relations of the plant communities known as plant societies, and may be called physiographic ecology. The third line is a study of the great forest, grass, desert, and other formations of the globe in relation to climate, and may be called geographic ecology. See ECOLOGY.

Paleobotany. The study of fossil plants has developed with remarkable rapidity and has yielded valuable contributions to the study of morphology as well as to nonbotanical sciences such as geology. See PALEONTOLOGY.

Bacteriology. The science which treats of the peculiar group of plants known as bacteria has become of increasing importance because of the many relationships of the bacteria to the interests of man. Some bacteria are harmful, causing a wide variety of diseases; others are invaluable. Some cause the various processes of fermentation; others are involved in the reactions of putrefaction and rotting which return to the soil for renewed use the substances in dead animal and vegetable matter. Bacteria which grow on the roots of certain plants called legumes "fix" the nitrogen of the air, and thus provide directly or indirectly almost all of the protein which forms the principal foodstuff of man and other animals. See BACTERIA.

Phytopathology. Phytopathology is the science which treats of the diseases of plants, chiefly those caused by other plants. The physiology and cytology of diseased plants are also a part of this study, as are methods of cure. Some of the most important ills of plants are due not to disease but to injurious insects. See ENTOMOLOGY, ECONOMIC; DISEASES OF PLANTS.

Genetics. Most of the important advances in genetics have been made in the field of botany. In its scientific aspect it deals with heredity, while in its practical aspect it is revolutionizing the cultivation of plants. For example, recently in economic plant-breeding work, the question of sterility of hybrids has been shown to be of great importance. Horticulturists have known for many years that certain varieties of such fruit as apples, pears, plums, cherries, and grapes are self-sterile, and that a compatible variety should be introduced among the plantings if increased fruitfulness is desired. To cite another instance: profiting by the knowledge gained from



Plant morphology: great bur-reed, with male (small) and female flowers on same stalk

studies in genetics, plant breeders have been making important progress in the development of resistant strains and varieties of many of the common plants. Some of these have been extensively adopted in general agriculture and horticulture. Many experimenters claim that resistance to plant diseases can be built up by continued crossing with resistant forms and by repeated selection from among the progenies. A large number of superior strains of such crops as wheat, oats, flax, tobacco, potato, tomato, beans, peas, and cabbage have been developed in this manner. See POLLINATION; BREEDING; HEREDITY.

Applied Botany. Much of the botanical work of agricultural experiment stations, as well as that of individual workers, has been concerned with fertilization and processes of selective breeding. The idea of separate sexes in plants was known in Biblical and Egyptian times, and the fertilization of date palms by controlled pollination was regularly practiced. Carefully controlled pollination by hand has been the key not only to the development of

new varieties of plants, but to the present important industry of producing hybrid seed for such plants as corn. The discovery of the part played by insects and birds in pollination furnishes one of the most interesting chapters in modern empirical botany. Another important applied study is found in plant nutrition and respiration. Geographical botany has added an immense store of new species, both for decorative and agricultural purposes. Diseases of plants have been extensively studied and many brought under control.

In addition to the articles mentioned above, see AGRICULTURE; FLORICULTURE; HORTICULTURE; FORESTRY; GEOGRAPHICAL DISTRIBUTION OF PLANTS; PHOTOPERIODISM. See also PLANT.

BOTFLY, a parasitic fly of the family Oestridae, also called bot, breeze fly, gadfly, or warble fly. Some of these names are also applied to the horsefly (q.v.). Originally called a genus (*Oestrus*) by Linnæus, the botflies are now considered by some entomologists to constitute several families. Thus, the botflies of horses, genus *Gasterophilus* (or *Gastrophilus*), may constitute a separate family, Gasterophilidae. The botfly of sheep belongs to the genus *Oestrus;* the botfly of cattle to the genus *Hypoderma.* There are other genera which infect rodents, deer, and, in the tropics, monkeys and even man.

Only the larvae, or bots, of the botflies are parasites, the adults in all cases being harmless. The adults have short antennae, large heads, and long legs. Their mouths, however, are small, and many are unable to eat. For specific descriptions of their appearance and habits, see HORSE BOT; SHEEP BOT; OX BOT.

BOTHA, LOUIS (1862–1919), South African soldier and statesman, born in Greytown, Natal. In 1884 he was a leader of the group of Boers who founded New Republic, in Zululand, where he later became a farmer and held various governmental positions. He was elected in 1897 to the *Volksraad* (legislature) of the South African Republic, but following the outbreak (October, 1899) of the conflict known as the South African War, he joined the South African army as a junior officer and quickly rose to the command of the Boer units operating in the vicinity of Ladysmith, Natal. His troops inflicted a number of severe reverses on the British in this area, especially at the battle of Colenso (December, 1899). In March, 1900, he became commander in chief of the South African (Boer) army. A series of British victories had severely weakened the Boers meanwhile, and he was forced to continue the struggle on a guerrilla basis. In May, 1902 the Boer leaders realized that further resistance was futile; Botha helped to negotiate peace terms with the British. Under the terms the South African Republic was annexed to Great Britain as the crown colony of Transvaal, but the Boers obtained various concessions, including a promise of eventual self-government.

With Botha as its first prime minister, Transvaal became a self-governing colony in 1907. Botha attended the constitutional convention (1908–09) which brought about the establishment of the Union of South Africa, and was chosen prime minister of the Union. One of the chief problems confronting Botha as head of the Union government was the mutual antagonism between the Boer and British sections of the population. An advocate of a conciliatory policy on this question, he succeeded in curbing the anti-British faction among the Boers until the outbreak of World War I. His support of the British declaration of war against Germany met violent opposition, and when he subsequently committed the military forces of the Union against German Southwest Africa thousands of Boers revolted. Taking personal command of the Union forces, Botha suppressed the insurrection, defeating the last of the rebel forces in February, 1915. He led the invasion of German Southwest Africa in March of the same year, and in less than four months destroyed all enemy opposition. Throughout the remainder of World War I Prime Minister Botha was engaged in mobilizing his country in support of the Allied war effort. He attended the Paris Peace Conference (1919) after the Allied victory, and was one of the signers of the Treaty of Versailles.

BOTHE, WALTER (1891–1957), German physicist, born in Oranienburg, Prussia, and educated at the University of Berlin. From 1925 to 1934, he taught successively at the universities of Berlin, Giessen, and Heidelberg. After 1934 he was director of the physics division of the Kaiser Wilhelm Institute for Medical Research (renamed after World War II the Max Planck Institute) at Heidelberg. Bothe conducted important experimental research in the study of cosmic rays (q.v.) and of nuclear structure. He is noted for his invention of the coincidence-counting method, a sensitive technique of detecting and measuring nuclear-particle events by means of Geiger counters; see IONIZATION CHAMBER. In 1954 Bothe shared the Nobel Prize in physics with the German-British physicist Max Born.

BOTHNIA, GULF OF, northerly arm of the Baltic Sea, lying between Finland on the E. and Sweden on the W. It is 415 m. long, 93 to 149 m. wide, and from 164 to 330 ft. deep. The Åland Islands are generally regarded as the dividing line between the Baltic proper and the Gulf of Bothnia. Along the shores of the gulf and in the central portion are many small islands, sand banks, rocks, and cliffs, called *skaers,* which render navigation difficult. Numerous rivers empty into the gulf, from both Sweden and Finland, reducing the salinity of its waters. In winter it is usually frozen so solid that the journey from Sweden to Finland can be made on sledges. The shores of the gulf are gradually rising, causing increasing shallowness of its harbors. The rise of the bottom is estimated at nearly 5 ft. per century.

BOTHWELL, JAMES HEPBURN, 4th EARL OF (1536–78), Scottish nobleman, the husband of Mary, Queen of Scots. At about twenty years of age he succeeded to the titles, lands, and hereditary offices of his father, including that of Lord High Admiral of Scotland. In 1561 he was one of a deputation of lords sent to convey the young Queen Mary to her kingdom. He became a privy councilor, but because of the riots and disorders in which he was engaged, was commanded to leave Edinburgh. In 1562 he was imprisoned on the charge of an attempt to seize the Queen, but escaped and, after many adventures including a brief imprisonment by Elizabeth in the Tower of London, fled to France. In 1565 he was recalled to Scotland by Queen Mary to aid in suppressing Murray's rebellion. The next year, after the murder of her adviser David Rizzio (q.v.) by her husband, Lord Darnley, the Queen took refuge with Bothwell at Dunbar.

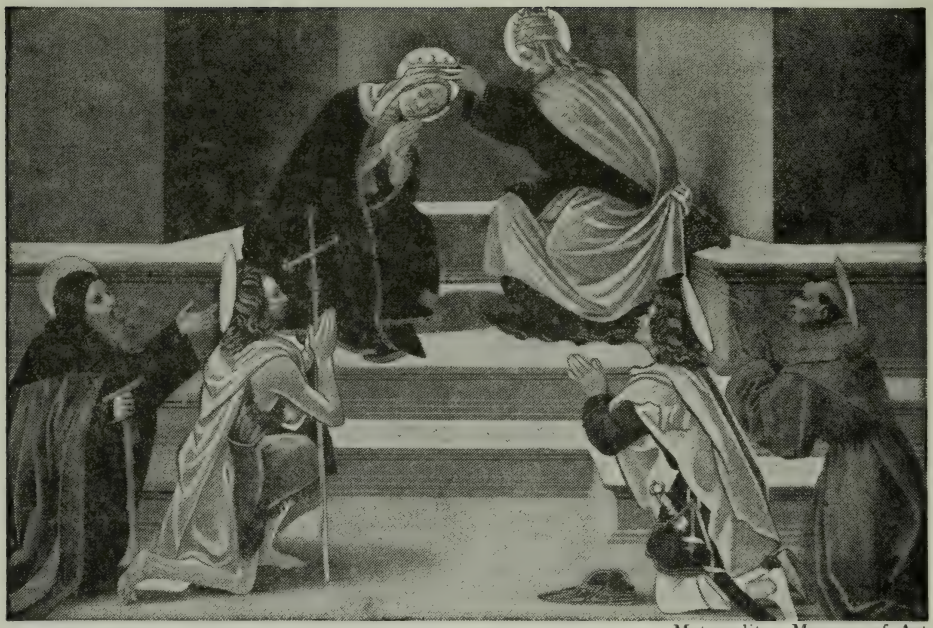
In 1567 Darnley was murdered, almost certainly by Bothwell with the consent of Mary, over whom he had achieved complete domination. He was put on trial for the crime, but appeared with 4000 armed retainers and obtained an easy acquittal. Shortly thereafter, he abducted the Queen, with her evident connivance, and carried her to his castle at Dunbar. He obtained a divorce from his wife, Jean Gordon, sister of the Earl of Huntly, to whom he had been married a little more than a year; he was then created Duke of Orkney and Shetland, and was formally married to the Queen.

These high-handed measures resulted in a general union of the Catholic and Protestant lords for his destruction. Queen Mary and Bothwell, with a strong force, met the insurgents, but the royal army deserted without a battle. Bothwell fled to Orkney and Shetland, and became leader of a band of pirates. He eluded all attempts by the English to capture him, and escaped to Norway, at length reaching Copenhagen, where he was for a time well treated because of his promise to restore the Orkneys and Shetlands to Denmark. In 1570 Queen Mary secured a divorce from him, and in 1573 after her imprisonment in England Bothwell was placed in close confinement in Dragsholm castle in Zealand, where he went insane and so remained until his death. His titles and estates were forfeited to the crown.

BOTOCUDO (Port. *batoque,* "plug"), name applied to a South American Indian tribe of the Tapuyan (q.v.) linguistic stock, living chiefly in the region between the Pardo and Doce rivers, in southeastern Brazil. The name of the tribe, also known as the Aimores or Aimbores, alludes to the tribal custom of wearing wooden plugs in the ears and lips. The culture of the Botocudos is extremely primitive. The tribe, consisting of a few thousand individuals, is nomadic, and its members subsist mainly by hunting and fishing. The Botocudos are generally short and stocky, and have Mongolian features and a light brown skin.

BO TREE, name of the pipal, or fig tree, at Buddh Gaya, India, under which Buddha is said to have sat when he attained enlightenment (see BUDDHA and BUDDHISM). This tree is no longer in existence but a pipal in Ceylon, amid the ruins of Anuradhapura, 80 miles N. of Kandy, is revered by Buddhists because they believe it to have grown from a transplated branch of the original Bo Tree. The name *bo tree* is applied to the fig trees of the species *Ficus religiosa* (see FIG).

BOTRYCHIUM, a genus of ferns of the family Ophioglossaceae, having a short, erect rootstock, with clustered fleshy roots, bearing a leaf, one part of which is sterile and fernlike, the other fertile and carrying the clusters of sporangia or spore cases. The only British species is the *Botrychium lunaria* ("moonwort"), which is also found in N. United States and S. Canada. It is a small plant, rarely more than six inches tall, growing in dry mountain pastures. It differs in appearance from other ferns in that its fleshy fronds, each with fan-shaped divisions, resemble the pinnate leaves of a flowering plant. About a dozen other species of *Botrychium* occur in



Metropolitan Museum of Art

"Coronation of the Virgin," painting by Sandro Botticelli

the United States, the most wide-ranging one being *B. virginianum*. It abounds in many parts of the United States, in the mountains of Mexico, in Australia, in some parts of Asia, as the Himalaya Mountains, and is found also in Norway, although in no other part of Europe. It is sometimes called rattlesnake fern in certain parts of America, because it frequently grows in places where rattlesnakes are found.

BOTTA, Carlo Giuseppe Guglielmo (1766–1837), Italian poet and historian, born in Piedmont. As a young physician he entered vigorously into the spirit of the French Revolution, was imprisoned in Piedmont (1792), and later served with Napoleon, who rewarded him with various appointments. He was a consistent supporter of Italian independence. His historical works, written in a style of accuracy and elegance, include *History of the American War of Independence* (1809), and *History of Italy*.

BOTTA, Paul Émile (1802–70), French archeologist and son of Carlo Giuseppe Guglielmo Botta, born in Turin. During his early career he visited North America, Egypt, and Arabia, collecting natural history specimens. In 1843 he excavated the ruins at Khorsabad, near Mosul, where he was French consular agent. He made a number of notable archeological discoveries, including remnants of the palace of Sargon II, King of Assyria (722–705 B.C.), and numerous Assyrian cuneiform inscriptions. He is the author of *Mémoires de l'Écriture Cunéiforme Assyrienne* (1848) and *Inscriptions Découvertes à Khorsabad* (1848), and he edited *Monuments de Ninive* (1847–50).

BÖTTGER, BOTTCHER, or **BOTTIGER,** Johann Friedrich (1682–1719), German chemist, born in Schleiz. He became familiar with various types of clay while searching for the philosopher's stone (see Alchemy). With royal patronage and aided by Count Ehrenfried Walter von Tschirnhaus, he turned his attention to pottery making and developed a hard, reddish porcelain, for the production of which factories were established in Dresden. In 1708 he was appointed director of these plants, which were moved to Meissen in 1710. His porcelain subsequently became known both as Dresden and Meissen china. He also originated several kinds of decorative glazes, and originated, in 1715, white porcelain. See Porcelain.

BOTTICELLI, Sandro (1444?–1510), Italian painter, born in Florence. His real name was Alessandro di Mariano dei Filipepi. He was apprenticed to his brother Antonio, a beater of gold leaf, and later to the painter

Fra Filippo Lippi (q.v.). Botticelli was one of the most important painters of the early Italian Renaissance. His work included religious, historical, and mythological paintings, as well as many portraits of contemporaries, usually included among the figures in his other types of work. His painting is characterized by a graceful and flowing line, bright color, and poetic atmosphere. Botticelli was under the patronage of a number of wealthy personages of Florence, and in particular of Lorenzo de Pierfrancesco de' Medici, for whom he painted two of his best-known works, "Primavera" (about 1477–78) and "Birth of Venus" (about 1485–88). Both paintings today are in the Uffizi Gallery, Florence. About the year 1482 Botticelli contributed a notable series of frescoes on Scriptural subjects to the Sistine Chapel of the Vatican. After 1497 Botticelli became a follower of the religious reformer Savonarola, and thereafter his religious pictures showed the influence of mysticism.

Among his other works are the paintings "The Temptation of Christ" (about 1482, Sistine Chapel, Rome), "Adoration of the Magi" (about 1482), "Madonna" (1486, Berlin Museum), "Mars and Venus" (between 1485 and 1488, National Gallery, London), "Coronation of the Virgin" (Uffizi Gallery, Florence), "The Madonna and Child" (Gardner Museum, Boston), and "The Last Communion of St. Jerome" and "The Coronation of the Virgin" (both in the Metropolitan Museum of Art, New York City); the drawing "Calumny of Apelles" (Uffizi Gallery); and a set of 96 illustrations for the *Divina Commedia* by Dante (between 1492 and 1495, Berlin Museum and Vatican Library, Rome). Many works formerly attributed to Botticelli were actually by Botticini (q.v.).

BOTTICINI, Francesco (1446–97), Florentine painter. Little is known of his life. His works were formerly attributed to other painters, particularly to Sandro Botticelli. But modern research, especially on the part of Bernard Berenson, has identified some of Botticini's paintings and established him as one of the outstanding artists of the 15th century. His works include "The Assumption of the Virgin" (National Gallery, London), "Madonna and Child with St. John and Angels" (Pitti Palace, Florence), "Adoration of the Magi" (Art Institute, Chicago), and "Madonna with a Landscape Background" (Hearst Collection, New York City).

BOTTLE, a hollow vessel with a narrow neck, for holding liquids. Bottles are made in various shapes, usually of glass or earthenware. In ancient times bottles were made of animal skins, principally those of goats. Of this kind were the bottles spoken of in Scripture. Skin bottles are still used in southern Europe for the transport of wine and water, and by tribes of Africa and Asia for carrying water. The ancient Egyptians made bottles of exquisite workmanship, of alabaster, stone, gold, ivory, and other substances.

Bottles made of glass came into general use in Europe in the 16th century, and until 1880 they were blown by expert craftsmen. After that date they were made by automatic bottle-blowing machines. In the 20th century metal cans and waxed cardboard containers wholly or partly displaced bottles for many purposes.

BOTTLE GOURD. See Gourd.

BOTTLEHEAD, or Bottlenose Whale, any of several whales with small snouts and large heads, especially the beaked whale, *Hyperoödon ampullatum*. The beaked whale is black above, shading to white beneath, and attains a length of 30 feet. It is found in the North Atlantic, in the waters just south of the Arctic ice, and is hunted for its oil, of which a large specimen may yield two tons. The name bottlehead is also applied to the blackfish and to several species of dolphin (qq.v.).

BOTTOMLEY, Gordon (1874–1948), English poet and dramatist, born at Keighley in Yorkshire, and educated at the grammar school there. He was awarded the Benson Medal (1925) and elected Fellow (1926) by the Royal Society of Literature, and received many other honors. He compiled *An Annual of New Poetry* (1917), and a collection of his poems was published in *Poems of Thirty Years* (1925). He also wrote many plays including *A Vision of Giorgione* (1910), *King Lear's Wife and Other Plays* (1920), *Gruach and Britain's Daughter* (1921), *Kate Kennedy* (1945), and *Maids of Athens* (1946).

BOTULISM, poisoning caused by eating food in which a specific bacterium, *Clostridium botulinum,* has developed. The term was originally used to cover all forms of sausage poisoning (Lat. *botulus,* "sausage"). It is now known that other diseases can be produced by eating decayed sausage, while the botulism organism can grow in many different types of meat and vegetables, and occurs commonly in soil.

Unlike such poisons as the ptomaines (q.v.), the botulism toxin frequently occurs in food

Metropolitan Museum of Art

Detail of "Sleeping Shepherdess," painting by François Boucher

which shows no sign of putrefaction. The ptomaines, moreover, develop only in the presence of air, whereas the bacteria causing botulism are anaerobic; see ANAEROBIC BACTERIA. Canned foods are therefore the principal source of botulism outbreaks, a sealed can or jar offering a perfect, anaerobic environment for the growth of this bacillus. Commercial canneries take precautions to prevent botulism, but the disease occurs occasionally among people who have eaten home-canned food.

The toxin produced by the botulism organism is one of the most poisonous substances known. Boiling the food for a few minutes destroys the toxin and renders the food harmless if it is consumed immediately. The spores of the bacillus, however, are resistant to heat, and ordinary boiling will not protect food against their development. Pressure cooking or preserving with strong brines or syrups will kill or inhibit the spores.

Botulism toxin has been extracted, purified, and crystallized, and its use in warfare suggested. See BIOLOGICAL WARFARE.

BOTVINNIK, MIKHAIL (1911–), Russian chess player, born in St. Petersburg (now Leningrad). In 1927 he tied for fifth place in the championship tournament of the Soviet Union, a notable achievement for one so young and relatively inexperienced. Botvinnik won the championship of the Soviet Union in 1931 and successfully defended it two years later. In 1934 he participated in his first international tournament, held in Moscow, and won it. Participation in other tournaments and matches, in the Soviet Union and abroad, including a match between the United States and the Soviet Union played by radio in 1945, established Botvinnik as one of the leading contenders for the world championship title, held by Alexander Alekhine (q.v.). A match between Alekhine and Botvinnik, arranged in 1946, was canceled because of Alekhine's death. Botvinnik became champion in 1948 in a tournament among the world's five leading players. He successfully defended his title in 1951 and again in 1954. However, Botvinnik lost the world championship title in April, 1957, when he was defeated by the Russian chess player Vassily Smyslov (1921–).

BOUCHARD, HENRI (1875–), French sculptor, born in Dijon. He studied with his father, a woodcarver, and at the École des Beaux-Arts, Paris. He was noted for his sculptures of laborers, among which are "The Laborer in Repose", "The Dockhand", and "The Blacksmith" (Metropolitan Museum of Art, New York City). Among his other works are the bronze statuette "Charles the Bold", and "Girl With Gazelle" (Metropolitan Museum of Art, New York City). In 1933 Bouchard was elected to the Académie des Beaux Arts de l'Institut Français.

BOUCHER, FRANÇOIS (1703–70), French painter, born in Paris. He studied painting with Lemoine and was apprenticed to Cars the engraver, but formed his style after Watteau. In 1723 he won the Grand Prix de Rome. He became a member of the Royal Academy in 1734, a professor in that body in 1739, and was made a director in 1765. He painted religious and mythological subjects, portraits, landscapes, still lifes, and animals. He was in favor with Madame de Pompadour, whose portrait he painted. He designed pastoral scenes for the tapestry factory of Beauvais (1734–55) and the Paris Gobelin tapestry works (1755–65). Among his principal paintings are "Rinaldo and Armida", "Diana Leaving the Bath", "Toilet of Venus", and the "Triumph of Galatea".

BOUCHES-DU-RHÔNE, a department of southeastern France, bordering on the Medi-

terranean Sea for 120 miles. It was formerly the western part of the province of Provence. The western part of the department, occupied by the Rhone delta, is marshy and has many ponds and lagoons; the central part is a dry stony plain; the east and north are hilly. Marseille (q.v.), the capital, is the chief seaport of France on the Mediterranean, and is the most important industrial center of the department. Other important cities are Aix and Arles (qq.v.). Commercial and industrial activities include shipbuilding, and production of silk, pottery, olive oil, soap, and paper. The area of land under cultivation has been increased by drainage in the delta region, and by warping in the arid plains. Agricultural products include olives, cereals, almonds, grapes, and figs. Area, 2025 sq.m.; pop. (1953 est.) 1,075,000.

BOUCICAULT, Dion (1820?–90), Irish dramatist and actor, whose name was originally Dionysius Lardner Boursiquot, born in Dublin. His first dramatic work, *London Assurance,* a comedy, was produced at Covent Garden in March, 1841, and was immediately successful. This play was followed by other successes, including *Old Heads and Young Hearts* (1845) and *Love in a Maze* (1851). He made his first stage appearance in 1852 at the Princess Theatre, London, in his own melodrama, *The Vampire.* During the next 7 years he appeared on the American stage, managed theaters in Washington, D.C., and New York City, and produced a number of notable plays, including his adaptation of Gerald Griffin's novel *The Collegians,* which was presented as *The Colleen Bawn;* and his original melodrama *The Octoroon,* set in s. United States and dealing sympathetically with the problems of the beautiful daughter of a Negro slave woman and a white plantation owner. In 1860 he returned to England, where both of these plays were enthusiastically received. His next outstanding accomplishment was his adaptation of *Rip Van Winkle,* in which Joseph Jefferson, celebrated American actor, began an extensive run, in London in 1865 and in New York in 1866. Boucicault's performance as Con in *The Shaughraun,* another of his plays, produced at the Drury Lane Theatre, London, in 1875, established his standing as one of the leading actors of the period. His first wife, Agnes Robertson, played leading roles in many of his productions. He is the author of more than 300 original plays and adaptations, and of *The Art of Acting,* an essay.

BOUDIN, Louis Eugène (1825–98), French painter, born in Honfleur, Calvados Department. He studied art at the École des Beaux-Arts in Paris and later became a member of a group of painters, the École St. Siméon, which included Courbet, Millet, Monet (qq.v.), and others. His fame began when the French government bought his "Corvette Russe" in 1888 for the Luxembourg Museum in Paris. He was noted for his marine landscapes, especially the tidal river scenes such as "Low Tide" and "The Incoming Tide". Included in his work, which is represented in the collections of museums in Europe and the United States, are "Rade de Villefranche" (Luxembourg), and "The Beach Near Trouville" and "Market in Brittany" (both in the Metropolitan Museum of Art, New York City).

BOUGAINVILLE, the largest of the Solomon Islands (q.v.), in the Pacific Ocean about 500 miles E. of New Guinea. It is part of the Australian Mandated Territory of New Guinea. The island is well wooded and very mountainous; it contains two active volcanoes, one of which, Mt. Balbi, rises to a height of over 10,000 feet. Kieta, principal harbor of the Solomons, is located on the east coast of Bougainville. The island was captured by the Japanese early in World War II, and was used as an important air base until the establishment of a beachhead there by American forces in November, 1943. The chief products are timber, coconuts, bananas, and yams. Area 3880 sq.m.; pop. (1952) 44,143.

BOUGAINVILLE, Louis Antoine de (1729–1811), French military officer and explorer, born in Paris. He entered the army in 1753, abandoning the practice of law; and at 25 wrote a treatise on integral calculus. In 1756 he became aide-de-camp to the Marquis de Montcalm in Canada, and served in the Seven Years' War against the British, taking part in the capture of Ticonderoga (1758) and the siege of Quebec (1759). In 1763 he entered the navy, and attempted to establish a colony in the Falkland Islands. The venture was abandoned because of objections by Spain, and Bougainville set sail on a voyage around the world (1766–69), in the course of which he made numerous important geographical and scientific discoveries. He visited Tahiti, the Samoan group, the New Hebrides, and the Solomon Islands. A strait in the New Hebrides group, and Bougainville Island in the Solomons and a strait off the coast of that island, are named for him, as is also the tropical American shrubby vine, Bougainvillea. When France came to the aid of the United States during the American Revolution, Bougain-

ville was appointed commander of a French ship of the line, and saw action under Count de Grasse. Late in life he was made a senator and count of the empire by Napoleon, and a member of the Legion of Honor. The *Journal* kept by him during his service in Canada is praised by the historian Francis Parkman. He also wrote *Voyage autour du Monde* (2 vols., 1771–72).

BOUGAINVILLEA, a small genus of climbing shrubs of the family Nyctaginaceae, mostly tropical South American, having the numerous flowers almost concealed by large membranous colored bracts. There are seven species, several of which are widely cultivated as hothouse or conservatory plants. The group was named for Louis de Bougainville. *B. spectabilis* is a tall shrub often used to cover trellises and is attractive because of its large clusters of flowers with deep-rose to purple bracts. *B. glabra* is a smaller plant, with rosy-red bracts. *B. sanderiana* is of brighter color, blooms profusely, and is considered a desirable plant for growing in pots.

BOUGHTON, George Henry (1833–1905), American genre and landscape painter, born near Norwich, England. His family emigrated to America when he was a child and settled at Albany, N.Y., where he received his first instruction in art. After 1861 he was a resident of London. He became a member of the National Academy of Design in 1871 and of the Royal Academy in 1896. Among his best-known paintings are "Puritans Going to Church" (1867, Public Library, New York); "The Edict of William Testy" (1877, Corcoran Gallery, Washington, D.C.); "The Scarlet Letter" (1881); "Weeding the Garden" (1882, National Gallery, London); "Golden Afternoon" (1888, Metropolitan Museum of Art, New York); and "Strome Valley" (1904).

BOUGIE, fortified Mediterranean seaport of Constantine Department, Algeria, situated on the Bay of Bougie, about 115 miles E. of Algiers. Wine, minerals, wool, hides, and oils are the chief articles of trade. Founded in ancient times by Carthaginians, the city became an important commercial and military center (called *Saldæ*) of the Roman Empire. In the 5th century it was seized and fortified by Genseric, King of the Vandals. The city was occupied by Berbers in later times, and in 1062 became the capital of a Berber dynasty. For a long period thereafter it was one of the chief ports of North Africa. After successive occupations of the region by Spain and Turkey, in the 16th century, the city declined in importance until, at the beginning of the 19th century, it contained little more than ruins. Following its capture by the French in 1833, however, Bougie regained a large part of its former importance. The harbor was enlarged and improved, and the town was connected by a spur line to the Tunis-Oran railroad. Pop. (1948) 28,547.

BOUGUEREAU, Adolphe William (1825–1905), French figure and mural painter, born in La Rochelle. He studied under Picot, winning the Grand Prix de Rome in 1850. He became a member of the Institute in 1876 and an Officer of the Legion of Honor in 1903. His most famous paintings include "La Vierge Consolatrice" (1877), "The Birth of Venus" (1879), and "The Body of St. Cecilia Borne to the Catacombs" (1898), all in the Luxembourg Palace, Paris.

BOUILLON, Godefroy de. See Godfrey of Bouillon.

BOULANGER, Nadia (1887–), French composer and teacher, born in Paris and educated at the Paris Conservatory. In 1908 her cantata "La Sirène" won the 2nd Grand Prix de Rome. She taught at the Paris Conservatory, the École Normale de Musique in Paris, and the American Conservatory at Fontainebleau. Among her pupils were the American composers Roy Harris, Aaron Copland, and Walter Piston, and the French composer Jean Francaix. She composed works for orchestra and solo instruments and, with R. Pugno, music for the play *Città Morte* by Gabriele d'Annunzio.

BOULDER, county seat of Boulder Co., Colo., situated 32 miles N.W. of Denver, at the eastern edge of a mining area rich in precious metals, and at the western edge of a fertile agricultural and dairying region. It is the site of the University of Colorado, established in 1877. Boulder is also noted as a vacation and health resort. It is the only city in America which derives its water supply from a glacier, the Arapaho Glacier. Boulder was settled about 1859 by gold-seekers, was incorporated in 1871, and in 1918 became a charter city operating under a city-manager form of government. Altitude, 5354 ft. Pop. (1950) 19,999, not including over 7000 University of Colorado students.

BOULE, in ancient Greece, designation applied originally to an advisory council and later to a representative legislative body. In Homeric times the boule, composed of nobles, was strictly a consultative body, convoked to assist the king. The Athenian boule, probably instituted by Solon (q.v.) as a semi-

democratic check on the Ecclesia, was called the "Boule on the Areopagus", later shortened to Areopagus (q.v.). At first the Athenian boule was composed of 400 members, elected from the upper classes, and functioned as a kind of steering committee of the Ecclesia. The size of the boule was increased (508–507 B.C.) by Cleisthenes (q.v.) who also transformed it into a genuinely representative organization, with jurisdiction over numerous judicial and administrative matters, including impeachments, naval maintenance, and control of revenues.

BOULOGNE-BILLANCOURT, or BOULOGNE-SUR-SEINE, a town of France, in the department of Seine, on the Seine R., 5 miles s.w. of Paris, from which it is separated by the famous park, Bois de Boulogne. It is an industrial suburb of Paris; its industries include extensive laundries and linen bleacheries, and factories for making perfumes, oils, and soap. Pop. (1946) 79,410.

BOULOGNE or **BOULOGNE-SUR-MER** (anc. *Gesoriacum;* later *Bononia*), seaport of Pas-de-Calais Department, France, situated at the mouth of the Liane R., on the English Channel, 22 miles s.w. of Calais. The city is an important fishing port and industrial center, with fish-curing establishments, foundries, cement plants, and factories producing textiles, cordage, earthenware, and boots and shoes.

Boulogne is divided into the upper and lower, or the old and new, districts. The upper city was built as a great stronghold, and its ramparts are now spacious boulevards, commanding a marine view with the coast of England at the horizon. At the east end stands a 13th-century castle with six turrets, the 18th-century hôtel de ville, and the 19th-century cathedral of Notre Dame, in Græco-Roman style, with a colossal statue of the Virgin surmounting the dome. The lower or new town has become the center of trade and social life. One of the chief points of interest is the marble Column of the Grand Army, 176 feet in height; this monument is surmounted by a bronze statue of Emperor Napoleon I, commemorating his projected invasion of England in 1804–05, when a large army was quartered in the city for an amphibious attack across the English Channel. During World War II Boulogne was taken by German forces in May, 1940; thereafter, the city was subjected to heavy air attacks by the Allies until September, 1944, when it was captured by Canadian troops in the Allied invasion of France. Pop. (1946) 34,885.

BOUND BROOK, borough of Somerset Co., N.J., on the upper Raritan R., about 22 miles s.w. of Newark. Its industries include the manufacture of paints, varnishes, lacquer, dyes, heavy chemicals, insecticides, ceramics, bearings and parts, and textiles. Bound Brook was first settled about 1700. On April 13, 1777, an American garrison at Bound Brook was surprised and routed by a force of British and Hessians. The Betsy Ross flag, it is said, was unfurled for the first time at the Bound Brook headquarters of General Washington, on June 14, 1777. Pop. (1950) 8374.

BOUNTY, a reward or premium granted by law as an inducement to the performance of a service regarded as beneficial to the public. Commercial bounties are designed to encourage the production or marketing of a particular commodity, or to foster the growth of new industry. They may be granted as subsidies or direct payments, or indirectly as reduced rates for transportation or as exemption from part or all of the amount of ordinary taxes. The U.S. has frequently paid commercial bounties; for example, the bounty paid for the production of domestic sugar under the act of 1890. In times of business depression, prices of agricultural products have sometimes been maintained by subsidies paid for exportation and for reduced production of farm products. Large grants of land and money have also been made by the Federal government and by the States to encourage such enterprises as the construction of railroads, irrigation projects, canals, and roads.

Bounties have also been widely used to encourage enlistment in the armed forces. In the U.S., this practice stems from colonial days, when grants of land and money were made in return for military service, and large sums of money were awarded for enemy scalps (see SCALPING). After the Revolution, Congress continued the practice of granting military bounties, and, by 1883, more than 58,000,000 acres of land had thus been distributed. During the Civil War such large bounties of land and money were paid that many recruits deserted after receiving the bounty, in order to re-enlist under another name and collect another bounty (see BOUNTY JUMPER). During the 19th century in Europe and America, bounties were paid to Navy crews for the destruction of enemy warships. This practice was discontinued in the U.S. in 1899. With the adoption of military conscription, the payment of bounties

for enlistment in wartime has almost entirely disappeared.

Bounties are also paid to encourage the destruction of undesirable animals. Agents paying this type of bounty are required to remove and destroy a specific part of the animal, such as the ear of a wolf, to prevent the carcass or skin being offered for the bounty again.

Large families have been subsidized in various countries of Europe, especially since World War I. Such bounties are paid in an attempt to increase the population or counteract a falling birth rate, and are paid on a sliding scale which favors a larger number of children.

BOUNTY, the name of an English vessel under the command of Captain William Bligh (q.v.), the crew of which in 1789 mutinied near the Friendly Islands and abandoned 19 men, including the captain, in a small boat with scant provisions. After many hardships the boat at last reached Timor, whence Bligh returned to England. In 1808 a settlement at Pitcairn Island (q.v.), in the South Pacific was discovered by a British ship that landed there; it had been established in 1790 by nine of the mutineers and a number of Polynesian women they had brought from Tahiti. The last of the mutineers, John Adams (q.v.), died in 1829, leaving a growing colony which was annexed to Great Britain ten years later. The story of the *Bounty* was used by Byron in his poem *The Island,* and formed the basis for a novel, *Mutiny on the Bounty* (1932) by Charles B. Nordhoff and James N. Hall, from which a motion picture was produced in the U.S. in 1935.

BOUNTY JUMPER, a term applied, during the Civil War in the United States, to a man who deserted the Union Army after enlisting to obtain the bounty (q.v.) given to volunteers. Some bounty jumpers enlisted in one place, deserted, and re-enlisted in another place. The United States government offered $30 for the apprehension and delivery of a deserter and the army provost marshals sometimes arrested as many as 3600 deserters a month. During the last years of the war, the bounty (which varied in amount from place to place and from time to time) was so large in New York that the bounty jumper could afford to buy immunity from arrest by offering his captor a larger sum than the reward for the deserter's arrest. Some men made a lucrative business of bounty jumping. Of more than 500 bounty jumpers arrested on March 11, 1865, the majority had deserted from three to twenty times. One man caught in 1865 confessed that he had "jumped the bounty" 32 times.

BOURBON, the name of a family of French origin, members of which became rulers of several European countries. The family derived its name from the castle and lordship of Bourbon, a town known in ancient times as Aquæ Borvonis. It was the capital of the former province of Bourbonnais (q.v.); it is now the village of Bourbon l'Archambault (pop. about 3000), located in the department of Allier in central France, about 15 miles W. of Moulins.

French Bourbons. The first known member of the Bourbon family, named Aimar or Adhemar, lived in the 9th century. A 13th-century descendant of Aimar, Beatrix, married Robert, the sixth son of King Louis IX of France, in 1272; on this marriage was based the claim of Henry of Navarre, 16th-century lineal descendant of Beatrix and Robert, to the French throne. Before the birth of Henry an elder line of the Bourbon family had ended with the death of Charles de Montpensier, Duc de Bourbon (q.v.), also descended from Beatrix and Robert.

The first member of the House of Bourbon to achieve royal rank was a son of Antoine de Bourbon, Duc de Vendôme, and Jeanne d'Albret, heiress to the throne of Navarre. This son became King Henry III of Navarre in 1572; with the death of the last Valois king of France, King Henry III, in 1589, Henry of Navarre became the first of a long line of Bourbon kings of France as Henry IV (q.v.).

Henry IV had five legitimate children, one of whom died without male heirs. The other four were his successor, King Louis XIII (q.v.), and three daughters, Elizabeth, Christina, and Henrietta Maria, through whose marriages the House of Bourbon was linked to the royal families of Spain, Savoy, and England.

The successor to Louis XIII was his son, Louis XIV, whose direct descendants continued to rule France as the elder line of the House of Bourbon. A brother of Louis XIV, Philippe, Duke of Orléans, was the founder of the collateral branch of Bourbons known as the House of Orléans (see ORLÉANS, DUKES OF). A grandson of Louis XIV, Philip Duke of Anjou, became King Philip V (q.v.) of Spain, the founder of the Spanish House of Bourbon (see below).

Both the son and eldest grandson of Louis

XIV died before that monarch's reign ended; he was succeeded by his great-grandson, Louis XV. This king also outlived his son, and was succeeded by his oldest grandson, Louis XVI. The latter and his only son, sometimes known as Louis XVII (although he never reigned), lost their lives during the French Revolution. After the defeat of Napoleon I in 1814, a brother of Louis XVI was restored to the French throne as Louis XVIII; at his death a younger brother, Charles X, acceded and was the last Bourbon king of France. (For each of these kings, see separate articles.) The descendants of Charles X became pretenders to the throne in the view of the adherents of the House of Bourbon, known as Legitimists. The eldest son of Charles X, Louis, Duc d'Angoulême (1755–1844), was called Louis XIX by the Legitimists, although he had renounced his right to rule. Subsequently Louis' nephew, Henri, Comte de Chambord, was proclaimed King Henry V by the Legitimists. At his death (1883) the elder line of Bourbons became extinct; the head of the House of Orléans was accepted by the Legitimists as the successor to Bourbon claims.

Spanish Bourbons. Philip, Duke of Anjou, was both grandson of King Louis XIV of France and great-grandson of King Philip IV of Spain. Charles II, childless only son of Philip IV, named Philip of Anjou as his successor; the death of Charles precipitated the War of the Spanish Succession (see SPANISH SUCCESSION, WAR OF THE), after which Philip of Anjou became King Philip V (q.v.). He was succeeded by his sons, Ferdinand VI and Charles III. Charles III had two sons, the elder of whom became King Charles IV of Spain; the younger became King Ferdinand IV of Naples, founder of the Neapolitan House of Bourbon (see below). The Emperor Napoleon I deposed Charles IV, but the Bourbons were restored under the son of Charles, Ferdinand VII (q.v.), who was succeeded by his daughter, Isabella II (q.v.). Her succession was disputed by Ferdinand's brother, Don Carlos de Borbón (q.v.), as a violation of the Salic Law; those supporting Carlos and his descendants were known as Carlists. Isabella's son, Alfonso XII, and her grandson, Alfonso XIII (q.v.), were the last Bourbon kings of Spain; the latter was deposed in 1931.

Italian Bourbons. Carlos de Borbón, brother of Ferdinand VI of Spain, conquered Naples and Sicily, and became Charles IV, King of the Two Sicilies. When he acceded to the Spanish throne as Charles III, he made his younger son King Ferdinand IV of Naples. The Emperor Napoleon I at first deposed Ferdinand, then restored him as King Ferdinand I of the Two Sicilies. In successive generations the throne passed to Francis I, Ferdinand II, and Francis II, at whose abdication (1861) the kingdom became part of the Kingdom of Italy.

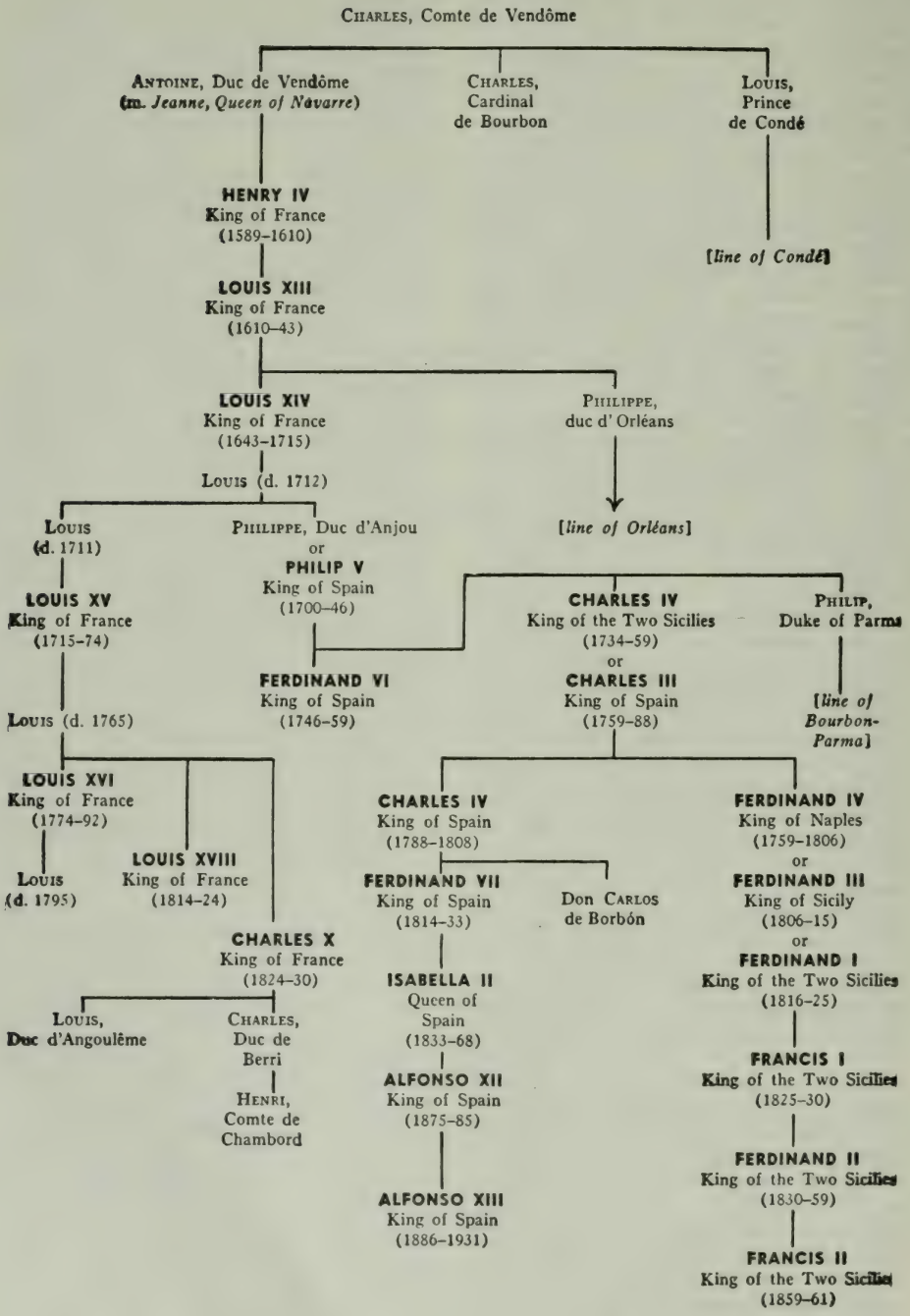
The youngest son of King Philip V of Spain conquered Parma, in Italy, in 1748, and became Philip, Duke of Parma (1720–65); his son was Ferdinand, Duke of Parma, and his grandson was Louis, made King of Etruria by the French in 1801. Charles Louis, son of Louis, was driven from Etruria by the French in 1807, and made Duke of Lucca in 1815 by Napoleon's conquerors, who simultaneously made Napoleon's widow, Maria Louisa, Duchess of Parma. On the latter's death in 1847 Charles Louis received Parma in exchange for Lucca. His son, Charles III, Duke of Parma, was in turn succeeded by his son, Robert, who lost the duchy upon its annexation to Italy in 1860.

See accompanying chart of principal rulers.

BOURBON, CHARLES DE MONTPENSIER, DUC DE (1490–1527), French general, known as the Constable de Bourbon. He was the son of Gilbert, Count of Montpensier. In consequence of the death of his elder brother, and his marriage with the only daughter of the Duke of Bourbon, he united in his own possession the vast estates of both these branches of the Bourbon family, which alone at that time retained the old feudal power. He distinguished himself by the brilliancy of his exploits in arms and by his rigid morals. Promoted at an early age to the highest military position in France, that of constable, he proved his ability by leading in 1515 the forces of Francis I across the Alps through passes considered, until then, impassable. His valor contributed greatly to the victory of Francis at Marignano (Sept. 13–14, 1515), and he followed up this success by the capture of Milan a few days later. From 1515 to 1519 he was governor of the Duchy of Milan.

For reasons not clearly established in history, he incurred the enmity of Louise of Savoy, mother of King Francis, and was deprived of his estates and his perquisites as constable (1523). In 1524 he renounced France and concluded a private alliance with King Henry VIII of England and the Holy Roman Emperor, Charles V, for the conquest and partition of France. Later that year, when the armies of France invaded Italy,

PRINCIPAL RULERS OF THE HOUSE OF BOURBON



he contributed to the victory won by the forces of Charles V. He commanded the Imperial army which, in Aug., 1524, unsuccessfully besieged Marseille, and fought in the battle of Pavia (Feb. 24, 1525), during which Francis I was made a prisoner. Although he was rewarded by Charles V with the Duchy of Milan, he subsequently turned against the Emperor, chiefly because the latter failed to furnish him with military supplies. In revenge, he led his army, composed of German and Spanish mercenaries, whose loyalty he bought with the promise of booty, against Rome. The assault on the city began on May 6, 1527. Bourbon was mortally wounded early in the action by a bullet reputedly fired by the celebrated Italian sculptor Benvenuto Cellini.

BOURBON. See RÉUNION, ÎLE DE LA.

BOURBONNAIS, a former province of central France, now comprised within the departments of Allier, Cher, and Nièvre. From 1327 to 1523 it formed the Duchy of Bourbon. In the latter year it was annexed to the crown, but was bestowed, in 1661, on the house of Bourbon-Condé, which held it until the Revolution.

BOURBON WHISKY, an alcoholic beverage made from a grain mash containing 50 to 80 percent of corn, from which it derives a distinctive flavor varying with the quantity of other grains used. It is named for Bourbon County, Kentucky, where distillers who came from Pennsylvania during the Whisky Insurrection of 1794 first made this type of whisky. See WHISKY.

BOURDALOUE, LOUIS (1632–1704), one of the great pulpit orators of France, was born at Bourges. He entered the order of Jesuits, and filled in succession the chairs of rhetoric, philosophy, and moral theology in the Jesuit College of his native place. His remarkable powers of eloquence determined his superiors to employ him as a preacher. At the court of Louis XIV he was well received. The year after the revocation of the Edict of Nantes he was sent to Montpellier to convert the Protestants. Adapting his style of preaching to the taste of his audience, he was equally a favorite with the common people and with the learned and the great. His sermons were edited by Bretonneau (16 vols., 1704–37).

BOURDELLE, ÉMILE (1861–1929) French sculptor and painter, born in Montauban. He studied under Rodin and subsequently became one of the latter's leading followers. Bourdelle's style shows the influence of archaic Greek and early French Gothic sculpture. His works include "The Archer Heracles" (1909), a replica of which is in the Metropolitan Museum of Art, New York City; the reliefs on the Théâtre des Champs Élysées, in Paris; and "Madonna and Child", in Monceaux, France. Among his portrait heads are those of Beethoven, Rodin, and Anatole France.

BOURDON, SÉBASTIEN (1616–71), French painter, born in Montpellier. He studied in Rome under the French landscape painters Claude Lorrain and Nicolas Poussin. His first painting to win critical acclaim was "Martyrdom of St. Peter", now in the Louvre, Paris. He subsequently became one of the ten original members, and rector, of the French Academy of Painting and Sculpture. From 1652 to 1654 he was court painter to Queen Christina of Sweden. His works include "Descent from the Cross", in the Louvre; "Group of Merchants", in the Museum of The Hague; and "Queen Christina", in the National Gallery, Stockholm.

BOURG or **BOURG-EN-BRESSE,** capital of the department of Ain, France, and formerly capital of the province of Bresse. Bourg is located 38 miles N.E. of Lyons, on the Reyssouze River. The town is notable for its church of Notre Dame (16th century, predominantly Renaissance in style), and the church of Brou (late Gothic style) built by Margaret of Austria between 1511 and 1536 in memory of her husband, Philibert II, Duke of Savoy. The principal products of Bourg are tallow, soap, hardware, earthenware, and mineral waters, and it carries on trade in grain, cattle, and poultry. Pop. (1946) 25,944.

BOURGEOIS, LÉON VICTOR AUGUSTE (1851–1925), French statesman, born in Paris and educated at the Lycée Charlemagne. From 1877 to 1895 he served in a number of important department and national offices, and from 1895 to 1896 was Premier of France. He was the leader of the French delegation to the Hague Peace Conferences of 1899 and 1907, and in 1903 became a member of the Permanent Court of Arbitration at The Hague. In 1919 he was the French representative on the commission that drafted the Covenant of the League of Nations, and from 1919 to 1924 was the chief representative of France in both the Council and the Assembly of the League. In 1920 he was awarded the Nobel Peace Prize. Among his writings are *Le Pacte de 1919 et la Société des Nations* (1920) and *Le Traité de Versailles* (1920).

BOURGEOISIE (from Fr. *bourg*, Ger. *burg*, "town"), a term which originally signified the townsmen or burghers of the Middle Ages. The principal component elements of the bourgeoisie were at first merchants, bankers, and artisans; and during the later Middle Ages, entrepreneurs. At the same time the bourgeoisie formed a growing class in feudal society, whose interests were in some respects incompatible with the interests both of the dominant landowning nobility and of the peasantry. Not as powerful as the former but politically stronger than the latter, the bourgeoisie occupied a social position between these two classes; hence their designation as a middle class. During the transformation of feudal society into modern capitalist society in Europe, the bourgeoisie was the spearhead of progress in science and industry, and of the resulting social change. The English revolution of the 17th century and the French Revolution of the 18th century were led by the bourgeoisie.

Some political economists and historians consider that with the overthrow of feudal society and the development of capitalist society, the bourgeoisie of the Middle Ages evolved into the capitalist class of modern society. These economic historians include the Marxists who use the terms bourgeoisie and capitalist class interchangeably. Other scholars retain the original signification of bourgeoisie as a middle class. Applying the term to modern society, they consider the bourgeoisie to be composed of groups—such as storekeepers, professionals, and small farmers—who are neither capitalists nor workers.

The term bourgeois is now sometimes applied as an epithet of mild contempt to an uncultured person whose preponderant concern is with material possessions.

BOURGES, capital of the department of Cher, France, and in medieval times capital of the province and Duchy of Berry. Bourges is situated 144 miles s. of Paris by rail, at the confluence of the Yévre and the Auron rivers. The town is on the site of *Avaricum*, an important settlement in Gaul at the time of Julius Cæsar. From 475 to 507 it was occupied by the Visigoths, and later was held successively by Clovis, Pepin the Short, and the Northmen. When Orléans was occupied by the English in the 15th century, Charles VII made Bourges his capital. Its university (founded by Louis XI in 1463), at which John Calvin, Jacques Amyot, and Theodore de Beza studied, was abolished during the French Revolution. Bourges has many notable old buildings, among them the church of St. Etienne, erected between the 12th and 16th centuries, one of the best examples of the Gothic style in France. The town is the seat of an archbishopric and is a military center. Bourges is a center for trade in the wine, vegetable, hemp, and grain produced in the surrounding district. It has ammunition works, iron foundries, tanneries, distilleries, brick and tile works, dye works, and saw mills; and manufactures tools, boots and shoes, and cloth. Pop. (1946) 51,040.

BOURGET, Charles Joseph Paul (1852–1935), French poet, critic, and novelist, born at Amiens. After a brilliant scholastic career at the lycée of Clermont-Ferrand and the Collège de Saint-Barbe, Paris, he became a journalist. He began his literary career as a poet, writing *La Vie Inquiète*, a volume of pessimistic verse, in 1874, and similar volumes in 1878 and 1882. Among his works of criticism are *Essais de Psychologie Contemporaine* (1883), *Nouveaux Essais* (1885), *Nouvelles Pages de Critique et de Doctrine* (1922), and *Quelques Témoignages* (1928). His first novel, *L'Irréparable* (1884), was followed by numerous other works of fiction; among them are *Cruelle Énigme* (1885), *Le Disciple* (1889), *Un Divorce* (1904), *L'Envers du Décor* (1911), *Le Danseur Mondain* (1925), and *Nos Actes Nous Suivent* (1927). In both his critical and fictional works Bourget showed great ability as an analyst of the psychology of his contemporaries, especially those of upper-class and cosmopolitan circles. His early works offer no cure for the decadent state of the society he portrayed, his attitude toward life being that of a passive observer, but in his later works he developed a religious and moral point of view. He was elected to the French Academy in 1894. Most of his works have been translated into English.

BOURGET, LE or **LE BOURGET-DRANCY,** a town in the department of Seine, France, about 6 miles N.E. of Paris. In the Franco-Prussian War the town was the scene of serious French reverses. It possesses an important aviation field. The American aviator Charles A. Lindbergh landed at Le Bourget at the conclusion of the first nonstop flight from New York to Paris, May 21, 1927. Pop. (1946) 7327.

BOURGOGNE. See Burgundy.

BOURIGNON, Antoinette (1616–80), Flemish religious mystic, born at Lille. She

was early convinced that she received supernatural revelations. At 20 she entered a convent, and subsequently had charge of a hospital in Lille and then of one in East Friesland. Believing herself appointed by God to restore the spirit of primitive Christianity, she taught that true Christianity consisted of impulses that had a supernatural source, and not in the mere doctrine or practice of any church. Her doctrine, known as Bourignianism, became widespread among both Roman Catholics and Protestants. At the beginning of the 18th century it was so prevalent in Scotland that the Established Church of Scotland demanded a solemn renunciation of it from every entrant to the ministry, at his ordination, a rule which is still in force. Antoinette Bourignon's complete works (19 vols., 1680–86) were edited by Peter Poiret, a Calvinist minister who was one of the chief expounders of her teachings.

BOURKE-WHITE, MARGARET (1906–), American photographer, born in New York City. After her graduation from Cornell University in 1927, she made photographic studies of major industrial plants in America, Canada, Germany and South America. From 1929 to 1933 she was an associate editor of *Fortune* magazine. In 1934 she photographed industrial establishments in the U.S.S.R. and produced the documentary motion pictures *Eyes on Russia* and *Red Republic*. In 1936 she became a correspondent-photographer for *Life* magazine, and served in this capacity in the European theatre of operations during World War II. Examples of her photography are on exhibition in several American museums, notably the Museum of Modern Art, New York City, and the Cleveland Museum of Art, Cleveland, Ohio. Included among her works are *U.S.S.R., A Portfolio of Photographs* (1934), *You Have Seen Their Faces* (with Erskine Caldwell, 1937), *North of the Danube* (with Erskine Caldwell, 1939), *Shooting the Russian War* (1942), *Dear Fatherland, Rest Quietly* (1946), and *Halfway to Freedom* (1949).

BOURNEMOUTH, a summer-resort city in Southampton, England, on Poole Bay, 107 miles by rail S.W. of London. The city was founded in 1810 and because of its mild climate and picturesque location became popular with visitors seeking health and relaxation. Bournemouth has piers, baths, arcades, drives, and a six-mile bathing beach. Pop. (1953 est.) 139,900.

BOURSE. See EXCHANGE.

BOUTS, DIERIK, DIRK, or THIERRY (1410?–75), Dutch painter, born at Haarlem. He was made town painter of Louvain in 1468. Bouts painted portraits and religious pictures; in the latter he was noted for his skill in using landscapes as background. He was particularly noted for his subtle coloring and his ability to obtain effects of space in interiors and landscapes. He is considered, after Jan van Eyck (q.v.), the foremost Dutch painter of the 15th century. His best-known works are the five panels on biblical themes painted for the altar of the Chapel of the Sacrament, Church of St. Peter's, Louvain. Among his other paintings are "The Birth of Christ" and a portrait, possibly of himself (both in the National Gallery, London); "Bewailing of Christ's Body" (Louvre, Paris); and "Madonna and Child" and "Portrait of a Man" (both in Metropolitan Museum of Art, New York City).

BOUTWELL, GEORGE SEWALL (1818–1905), American senator and cabinet officer, born in Brookline, Mass. Between 1842 and 1851 he was seven times chosen to the Massachusetts Legislature. Thenceforth he was a leader of the Democratic Party in his state, was chosen Governor in 1851, and was re-elected the next year. On the repeal of the Missouri Compromise in 1854, he left the Democratic and assisted in the organization of the Republican Party. In 1862, as commissioner, he organized the new Department of Internal Revenue; in 1863 he entered Congress, and was twice re-elected. In 1868 he was one of the managers of the impeachment of President Johnson, from 1869 to 1873 was Secretary of the Treasury, and in the latter year was elected United States Senator. In 1887 he was appointed by President Hayes to prepare a codification of the statutes-at-large. The result was the second edition of the *United States Revised Statutes* (1878).

BOUVINES, BATTLE OF, decisive military engagement between the French army and the armies of a coalition of European powers, fought on July 27, 1214, near the village of Bouvines, France, about 10 miles S.E. of Lille. The armies of the coalition, which had been established for the purpose of curbing the growing power of France, were led by the excommunicated Holy Roman emperor Otto IV, King John of England, the count of Flanders, and several minor princes. King Philip Augustus, commanding the French army, had the support of Frederick Hohenstaufen, papal-approved rival of Otto IV for the Holy Roman crown. Philip Augustus won the battle

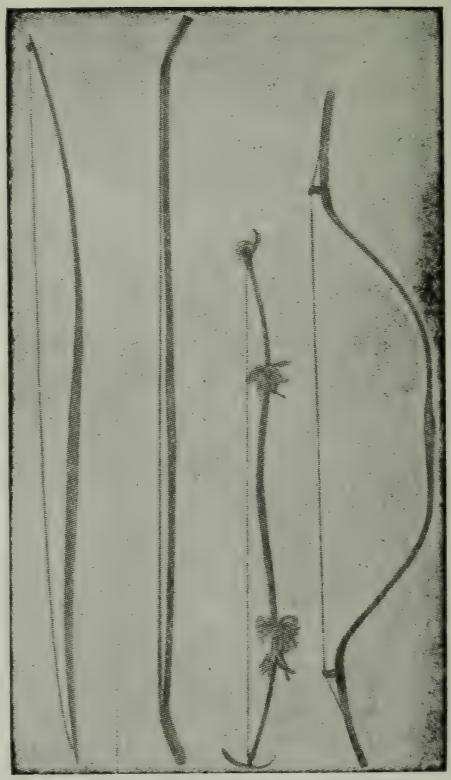
by virtue of the superiority of his cavalry over that of his enemies, and of the militia of the free French towns (communes) over the regular feudal infantry. Both sides suffered thousands of casualties. As a direct result of the Battle of Bouvines Frederick of Hohenstaufen became (1215, as Frederick II) Holy Roman emperor and France became one of the leading powers of Europe; as an indirect result King John, incapable of offering further resistance to the rebellious English barons, was compelled to sign (June 15, 1215) the Magna Charta (q.v.).

BOVIDAE (Lat. *boves,* "oxen"), a large family of ruminants (sub-order Pecora) in the order of cloven-hoofed mammals (Artiodactyla). They are characterized by the presence of unbranched, hollow horns in one or both sexes. The horns are never shed and continue to grow throughout life. An old name for the Bovidae was Cavicornia (Lat. *cavus* "hollow"; *cornus,* "horn").

The relationships of the Bovidae are complex; one method of classification divides the family into subfamilies as follows: *Bovinae* includes bison, buffaloes, and all wild and domestic cattle. *Ovibovinae* has but a single species, the musk-ox. *Caprinae* includes sheep and goats. *Rupicaprinae* includes many diverse species, among which are the chamois, goral, Rocky Mountain goat, serow, and takin. The several remaining subfamilies are generally grouped under the term "antelopes".

The Bovidae is primarily an Old World family; it is represented in the western hemisphere only by the American bison, the musk-ox, the bighorn, and the Rocky Mountain goat. In the wild state, members of this family are gregarious, nomadic animals, swift of foot, eating hurriedly, masticating and digesting at leisure. They feed on grass and herbage. The flesh, fat, milk, hair, skin, viscera, bones, horns, and dung are in common use, and the animals themselves have in many cases become beasts of burden.

BOW, in archery, a weapon by means of which an arrow is projected. The bow consists of a strong strip of wood, steel, or other flexible material, the bent ends of which are connected by a taut cord, or string; the arrow is propelled by the recoil of the bow after the string has been pulled back and then released. The bows used in England were at first the type known as *self* bows, which were made of one piece of wood, generally yew, throughout. Two additional types of bow are used today, the *backed* or *union* bow, which consists of 2 pieces of wood; and the *three-woods*



NATIVE BOWS. *From left to right: Andaman, India; Yakut, Siberia; North American Plains Indian; Mongolian native.*

bow, consisting of 3 pieces of wood. The bow varies in length from 5 feet 6 inches to 6 feet; its weight varies according to the requirements of the archer; and its strength is determined by the number of pounds it takes to pull the string 28 inches from the bow. See ARCHERY; CROSSBOW.

BOW BELLS. See COCKNEY.

BOWDITCH, NATHANIEL (1773–1838), American mathematician, born in Salem, Mass. During his apprenticeship to a ship chandler, he found time to teach himself algebra and other branches of mathematics, as well as Latin. He went to sea as a clerk in 1795 and soon rose to be captain of his own ship, largely through his mastery of the art of navigation. His classic work, *The New American Practical Navigator* (1802), is still used as a standard text.

After receiving an honorary M.A. degree from Harvard, Bowditch was offered a number of professorships. He declined them to be-

come an actuary for an insurance company. Continuing his mathematical studies, he completed a translation and annotation of four volumes of Laplace's *Mécanique Céleste*. He served as president of the Boston Academy of Arts and Sciences and was a Fellow of the Royal Society of London.

BOWDOIN COLLEGE, a nonsectarian school for men at Brunswick, Me. It was named in honor of James Bowdoin, governor of Massachusetts (1785–87) when Maine was a part of that State. The college was chartered in 1794, but students were not enrolled until 1802. Bowdoin provides courses in the liberal arts and sciences leading to A.B. and B.S. degrees. In 1953–54 the total enrollment was 747, including 741 full-time students; the faculty numbered 71, and the library contained 227,000 volumes. Among Bowdoin graduates are Franklin Pierce, 14th President of the U.S., Henry W. Longfellow and Nathaniel Hawthorne, American writers, and Robert E. Peary, the explorer.

BOWELS. See INTESTINE.

BOWEN, ELIZABETH DOROTHEA COLE (1899–), Irish novelist and short-story writer, born in Dublin, and educated in England. She began to write short stories at the age of twenty, and *Encounters,* her first short-story collection, was published in 1923. Her first novel, *The Hotel,* appeared in 1927. Elizabeth Bowen is a subtle, perceptive, often witty observer of upper-class life. One of her favorite themes is the predicament of the sensitive individual in conflict with an unsympathetic environment. Her writings include, besides the works cited above, the short-story collections *Joining Charles* (1929), *The Cat Jumps* (1934), and *The Demon Lover* (1945); the novels *The House in Paris* (1935), *The Death of the Heart* (1938), *The Heat of the Day* (1949), and *A World of Love* (1955); the essays *Collected Impressions* (1950); and the historical work *The Shelbourne Hotel* (1951).

BOWERBIRD, a bird of the Australian family Ptilonorhynchidae, considered by some ornithologists to be a subfamily of the bird-of-paradise family, and by others to be closely related to the crows. The bowerbird builds a bower or playhouse of twigs, apart from its nest, and ornaments it at or near the entrance with bones, shells, feathers, or any bright-colored object it can steal. The satin bowerbird (*Ptilonorhynchus holosericus* or *P. violaceus*) is the best known; the spotted bowerbird (*Chlamydera maculata*) is another species, building longer bowers.

The bower consists of a dome-shaped gallery, with the sides and floor formed of sticks and twigs, so placed that they nearly meet overhead and the bird can go back and forth through the playhouse. The gardener bowerbird (*Amblyornis inornatus*) of New Guinea builds a conical hut, and in front of this is a stretch of soft moss brought by the bird and kept free from weeds or stones. Upon it are scattered flowers and fruit to make it look like a little garden. As these lose their freshness they are replaced by others. The play element is highly developed in these birds; they flit about decorating the bower, and play with one another when it is finished.

The satin bowerbird is particularly abundant in the mountainous districts of the west of New South Wales, and is found in all the "brushes" from the mountains to the coast. The adult male has the whole plumage of a deep, shining black. The colors of the female are grayish green and brown.

BOWERY, THE, avenue in New York City, parallel to Broadway between Chatham Square and the junction of Third and Fourth avenues at Cooper Square. Originally an Indian trail, it was known to the early Dutch settlers on Manhattan Island as the road to the *bouwerij* ("farm"), an allusion to Governor Peter Stuyvesant's estate near its northern end. New York City's theatrical district was concentrated along the Bowery from 1860 to 1875, and about the turn of the century the avenue became a center for the Yiddish theater. About 1870 the Bowery became notorious as the main thoroughfare of a region devoted to amusements and vice. Today it is a street mainly of pawnshops, small stores, and inexpensive lodging houses and restaurants catering to the destitute.

BOWFIN, or MUDFISH (*Amia calva*), an archaic type represented now by only one species, inhabiting the fresh waters of the Mississippi and Great Lakes. Its order is Cycloganoidea and its family Amiidae. It is about 2 ft. long, weighs 12 lbs., and has an oblong body covered with hard, round scales, and a rounded snout, powerful teeth, and a long, soft dorsal fin.

BOWHEAD. See WHALE.

BOWIE, JAMES (1799–1836), American pioneer, born in Logan Co., Kentucky (according to some authorities, Burke Co., Georgia). He settled in the Mexican province of Texas in 1828, becoming a naturalized Mexican citizen. From 1832 he took a prominent part in the revolt against Mexico and was commissioned colonel in the Texas army. In

Bowfin: a rare albino

1836, although ill with typhoid-pneumonia, Bowie, with Col. William Travis and Col. David Crockett, took part in the heroic defense of the Alamo (q.v.), and was killed in the battle. Bowie County and the city of Bowie in Montague Co., both in Texas, are named for James Bowie. See BOWIE KNIFE.

BOWIE KNIFE, a strong, single-edged hunting knife with a blade 9 to 16 inches long. The edge, slightly convex, is sharpened along its entire length; the back, straight and unsharpened for most of its length, is sharpened in a concave curve forming a characteristic horn-shaped point. This knife was invented by Rezin P. Bowie and improved and popularized by his brother, Col. James Bowie (q.v.).

BOWLES, CAROLINE. See SOUTHEY.

BOWLES, CHESTER (1901–), American business man and public administrator, born in Springfield, Mass., and educated at Sheffield Scientific School, Yale University. He was engaged in the advertising business from 1925 to 1941, when he was appointed rationing administrator for Connecticut of the Office of Price Administration, a national agency established to maintain price controls during World War II. He became Connecticut State Director of O.P.A. in May, 1942, national General Manager of O.P.A. in July, 1943, and Administrator of O.P.A. in Oct., 1943. In February, 1946, President Truman appointed him Director of the Office of Economic Stabilization, a position from which he resigned 4 months later in protest against legislation on price control. He served as governor of Connecticut (1949–51). Bowles was ambassador to India from 1951 to 1953. He wrote *Ambassador's Report* (1954), *The New Dimensions of Peace* (1955), *American Politics in a Revolutionary World* (1956), and *Africa's Challenge to America* (1956).

BOWLES, WILLIAM LISLE (1762–1850), English poet and clergyman, born in King's Sutton, Northamptonshire, and educated at Trinity College, Oxford. He was vicar of Bremhill, Wiltshire, from 1804 to 1850. His *Fourteen Sonnets* (1789) deeply influenced Southey, Coleridge, and Wordsworth. Among his longer poems are *The Spirit of Discovery* (1804), *The Grave of the Last Saxon* (1822), and *St. John in Patmos* (1833).

BOWLING, indoor game in which players roll wooden or composition balls along a wooden runway called an *alley,* attempting to overturn ten wooden uprights, called pins, in the fewest possible rolls. Bowling is popular in the United States and Canada; it is played also in Great Britain, Norway, Sweden, Finland, and, with nine pins, in Germany. The modern game apparently evolved from the old game of skittles (q.v.), which was based on the older game of bowls (q.v.). These games, played outdoors, were brought to America by the early Dutch and English settlers. The earliest recorded indoor match, with nine pins set up in diamond formation, was played in 1840, in the Knickerbocker Alleys, New York City.

In 1875 the National Bowling League was organized in the United States. The rules were not standardized, however, and the conditions of play varied widely until 1895, when the American Bowling Congress (A.B.C.) was formed. This organization soon established rules which, with few modifications, have been observed ever since. From that time bowling steadily increased in popularity; it is now the most popular participant sport in the United States, with between 10,000,000 and 15,000,000 men and women as active players. The American Bowling Congress supervises the activities of thousands of bowling clubs, and holds annual championship tournaments in which titles are awarded to individuals, two-man teams, and five-man teams. In addition, the Women's International Bowling Congress, organized in 1916, holds similar annual tournaments for women.

The game is played on a level alley of polished wood, 41 to 42 in. wide, and measuring 60 ft. from the center of the first or head pin to the foul line behind which the bowler must release the ball. Back of the foul line is a runway of at least 15 ft., in which the player may take several running steps before releasing the ball, and 1⅞ in. back of the last row of pins is a padded pit to receive the balls and overturned pins. The pins are placed on pin spots 2¼ in. in diameter (the size of the bottom of the pin) and 12 in. apart from center to center, in a triangle of four rows, the first of which consists of a single pin. The pins are of hard wood, 15 in. in height, with a minimum weight of 3 lbs.; the neck is narrow and the sides taper

slightly to the base. The ball must not exceed 27 in. in circumference and 16 lbs. in weight; smaller sizes and weights are permissible. The ball contains either two holes, in which are placed the thumb and middle finger, or three holes, for the thumb and the middle and ring fingers.

The game may be played by any number of contestants; in tournament play it is usually played by two teams of one or two persons each. Each player rolls in turn, attempting to bowl down all the pins in two balls or a "frame". Should the player knock down all 10 pins with the first ball he is credited with a "strike", and adds to the 10 points thus scored the number of points made on the next two balls that he rolls. If the player knocks down some of the pins with one ball, and the remaining pins with his second ball, he scores a "spare", and to the 10 thus scored may add the points gained on the first ball he rolls during his next frame. Ten frames for each player constitute a game, the highest score possible being 300.

Popular varieties of bowling are "duck pins" and "candle pins", which are played with smaller balls and smaller or slimmer pins. The former variety is under the jurisdiction of the National Duck Pin Bowling Congress. Among other minor varieties of bowling are "head pins", "cocked hat", "cocked hat and feather", "quintet", "head pin and four back", "four back", "five back", "nine up and nine down", "seven up", "ninepins headpin out", "seven down", "white elephant", and the "Newport game".

BOWLING GREEN, county seat of Warren Co., Ky., situated on the Barren R., 67 miles N.N.E. of Nashville, Tenn., and 30 miles S.W. of Mammoth Cave National Park. It is the site of Western Kentucky State Teachers College, founded in 1906, and the Bowling Green Business University. Livestock raising and the growing of burley tobacco and strawberries are important industries in the surrounding region. Bowling Green is a shipping point for petroleum, which is produced in the vicinity, and for shale, limestone, and rock asphalt. Industries in the city include flour milling, meat packing, the processing of other agricultural products, and the manufacture of radio tubes. Pop. (1950) 17,427.

BOWLING GREEN, public park of New York City, situated at the southern end of Broadway, near Battery Park (q.v.). Established by the early Dutch settlers of Manhattan as a parade ground, it adjoined Fort Amsterdam, the island's first defense outpost, which occupied the site of the present-day U.S. Custom House. In 1732 the city government authorized establishment within the parade ground of a "bowling green . . . for the recreation and delight of the inhabitants of the city . . .". The park later became the center of colonial New York's exclusive residential district. On Bowling Green stood the lead statue of the British monarch George III which was torn down by American patriots in 1776 and made into bullets for the Continental Army.

National Bowlers Journal

MODERN BOWLING

The proper form on releasing the ball is shown. Eyes are kept on the pins.

BOWLS (Fr. *boule,* fr. Lat. *bulla,* "bubble"), one of the oldest of outdoor games, probably prehistoric in origin. It is played on a smooth lawn with balls either weighted on one side or slightly ovoid, the object being to roll them near a stationary ball, called the "jack". In rudimentary form the game was played in England as early as the 13th cen-

tury (perhaps during the 12th century). By the early 18th century the "bowling green" was a recreation center in most English and Scottish villages. In the same century, bowls became popular in the British colonies in America. The sport was discontinued in New York during the American Revolution, and bowls seems to have been played very little thereafter in America until it was again introduced, in 1879, in Dunellen, N.J., by an enthusiast who had seen it played in England. Within a few years bowls clubs had been formed in many cities throughout the United States. The game later lost its popularity in the United States, but is still played in other countries, particularly Great Britain.

Bowls may be played by two or more contestants. The playing field, called a *green,* is not less than 40 yds. square and is surrounded by a ditch 6 in. deep and 1 ft. wide, flanked by a terrace. The green is divided into six "rinks", each usually about 20 ft. wide. The bowl, which is made of lignum vitae, must not exceed 16½ in. in circumference nor 3½ lbs. in weight. The mat, usually 22 in. long by 14 in. wide, is made of corrugated or perforated rubber, and is placed at one end of the rink; each player must keep at least one foot on it when playing. The *jack,* a white, porcelain ball about 2½ in. in diameter, is thrown from the mat at the beginning of play, and must come to rest on the rink and at least 25 yds. from the mat. The object of the game is to place the bowl against or as near as possible to the jack. See also Bowling; Skittles.

BOWMAN, Isaiah (1878–1950), American geographer, born in Waterloo, Ontario, Canada, and educated at Michigan State Normal College and at Harvard and Yale universities. He studied and taught at Yale from 1905 to 1909, when he was appointed assistant professor of geography. He accompanied the Yale Peruvian expedition of 1911, and in 1913 led an expedition to the central Andes. In 1915 he resigned his position at Yale to accept the directorship of the American Geographical Society. In this capacity he supervised the preparation of a map of Hispanic America on a scale of 1 to 1,000,000. Twenty years were required to complete this project. Following World War I, Bowman served as chief territorial specialist of the American Commission to Negotiate Peace, and on various other commissions, winning wide recognition as a political geographer. He became president of Johns Hopkins University in 1935. In 1943 and 1944, during World War II, he was vice-chairman of the Advisory Council of Post-War Foreign Policy of the State Department, and in 1944 he was also a delegate to the World Security Conference at Dumbarton Oaks. He served as adviser to the United States delegation at the United Nations conference in San Francisco in 1945. At different times during his career Bowman was president of the International Geographical Union, the Association of American Geographers, and the American Association for the Advancement of Science. He resigned the presidency of Johns Hopkins University in December, 1948. A few months later he was appointed by President Harry S. Truman to head the colonial development division of the Economic Co-operation Administration, the administrative agency of the European Recovery Program. His writings include *South America* (1915), *The Andes of Southern Peru* (1916), *The New World: Problems in Political Geography* (1921), *Design for Scholarship* (1936), and *Graduate School in American Democracy* (1939).

BOWMAN'S ROOT. See Gillenia.

BOWNE, Borden Parker (1847–1910), American philosopher and educator, born at Leonardville, N.J., and educated at Halle and Göttingen. He became professor of philosophy and dean of the Graduate School, Arts and Sciences, Boston University (1876). His published works include *Philosophy of Theism, The Christian Revelation* (1898); *Studies in Christianity* (1909); and *Kant and Spencer, a Critical Exposition* (1912).

BOWSTRING HEMP, any plant of the genus *Sansevieria* in the lily family, or the hemplike fiber produced by the plant. This fiber, formerly used for bowstrings, is silky, elastic, resistant to rotting in water, and about equal in strength to hemp. The individual strands of fiber are several feet in length and are obtained from the leaves of the plant, 40 lbs. of leaves yielding about 1 lb. of fiber. Cordage and coarse, strong cloth are made from it.

Ceylon bowstring hemp, *S. zeylanica,* is a stemless perennial which grows wild in the jungles and increases by runners; it is also cultivated for fiber. The leaves are thick and fleshy, sword- or lance-shaped, hollowed, and banded crosswise with white. The African species differ chiefly in having the leaves banded lengthwise with yellow. Several species are cultivated in the U.S., under the name of snake-plant, for their ornamental value.

BOX, a shrub or small tree of the family Buxaceae, native to the south of Europe and parts of Asia, but much used in the U.S. for garden and landscape purposes. Several varieties of the common box, *Buxus sempervirens,* are cultivated, ranging from dwarf types, often planted as edging for flower beds, to bushes reaching 20 ft. in height. The thick foliage of box is not harmed by severe trimming, and thus lends itself to shaping and topiary work.

BOX ELDER or **ASH-LEAVED MAPLE,** a small tree, *Acer negundo,* in the same genus as the true maples. Unlike the true maples it has compound leaves like the ash, and has been placed by some botanists in a separate genus, *Negundo.* It is found throughout the U.S. east of the Rocky Mountains except in E. New England. It grows rapidly even under unfavorable circumstances; although normally short, in rich, well-watered valleys it may attain a height of 60 ft. The wood of the box elder is soft and light and is suitable for woodenware and wood pulp. It is a good shade tree, and has been extensively employed for windbreaks and as a nurse tree for other species. In some parts of the U.S. sugar is made from the sap.

BOXER, breed of dog developed in Germany, during the second half of the 19th and early part of the 20th centuries, from a number of breeds, principally the bulldog and terrier. It was used originally for dogfighting and bullbaiting, but these sports were outlawed in most civilized countries by the end of the 19th century. Because of the boxer's courage, strength, and agility, it was adopted for police work in Germany, and subsequently in other countries. The dog was introduced in the United States at about the beginning of the 20th century; it is now one of the most popular dogs in the country. Unusually faithful, intelligent, and alert, the boxer makes a splendid pet. Among its physical characteristics are a massive head; an undershot jaw; a muzzle with a characteristic black mask; ears that are rather long and are set high; dark-brown eyes; a broad, black nose; a strong, round, and muscular neck; a deep chest; and well-muscled hindquarters. The dog has a short, glossy, smooth coat which is any of various shades of fawn or brindle in color. The male is from 22 to 24 inches in height at the withers and weighs about 66 pounds; the female is from 21 to 23 inches in height and weighs about 62 pounds.

BOXER REBELLION, in Chinese history, designation applied to a nationalist uprising (1900) against foreigners, the representatives of foreign powers, and Chinese Christians. Expulsion of all foreigners from China was the ultimate objective of the uprising. The name of the rebellion alludes to "righteous harmonious fists", English translation of an erroneously interpreted Chinese term meaning "Righteous Harmony Band". Beginning in 1899 the Righteous Harmony Band, a secret society of Chinese recruited among provincial militiamen, instituted a campaign of terror against foreign nationals, especially Christian missionaries, in northern China. Inspired by popular indignation over the economic and political exploitation of China by various European powers, the campaign had the support of the dowager empress Tzu Hsi, then regent of China and a vigorous foe of Occidental methods and influences.

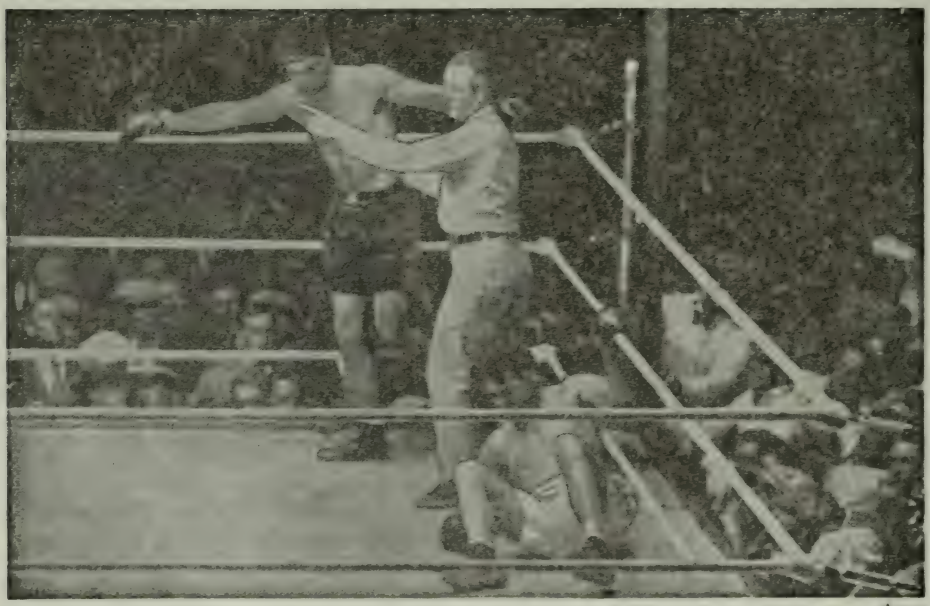
The terrorist phase of the society's activities culminated (June, 1900) in a general uprising in Peking, the Chinese capital. On June 20, in the course of the uprising, the German minister to the Chinese government was assassinated, and the approximately two hundred foreigners in the city were forced to take refuge in the British Legation. Meanwhile a relief expedition consisting of Japanese, Russian, British, American, and French troops had assembled at Taku. After heavy fighting the expedition succeeded (Aug. 14, 1900) in relieving the besieged legation, and occupied the city. The allies retained possession of Peking until a peace treaty was signed on Sept. 7, 1901. By the terms of the treaty the Chinese were required to pay (over a period of forty years) 450,000,000 Haikwan taels, or nearly $739,000,000 in gold, as indemnity. Other provisions included the conversion of ad valorem into specific duties, the fortification and guarding of the foreign-legation district in Peking, and severe penalties against further antiforeign disturbances. The United States Senate passed a resolution remitting to China $13,000,000 of the Boxer indemnity on Jan. 15, 1908. In June, 1924, all further payments were remitted by the Senate. Great Britain, France, Russia, and Japan suspended collection of the Boxer indemnity payments after the entry (Aug. 14, 1917) of the newly formed Chinese republic into World War I on the side of the Allied Powers.

BOXING, athletic game of skill and endurance, contested, according to certain established rules and procedures, by two male opponents who attempt to strike each other with gloved hands. In all boxing contests, the primary objective of each contestant is to

secure a knock-out, i.e. to strike the opponent with enough force to render him incapable of continuing. The game is highly popular, both as an amateur and as a professional sport, in the United States, Great Britain, France, and other countries of the western hemisphere. In the early stages of its development in the modern era, boxing was sometimes referred to as pugilism, a term that connoted brutality. Boxing contests, until late in the 19th century, were usually fought with bare fists. This custom and certain others, such as conducting fights to a finish, provided some foundation for the disfavor with which the sport was often regarded. After 1872, when a set of 12 regulations, drafted in 1865 by the Marquis of Queensberry (q.v.) and known as the Marquis of Queensberry Rules, were established as the governing code of the sport, the various pugilistic practices popularly regarded as barbarous were eliminated. Fighting with bare knuckles was outlawed, as were wrestling and hugging, and hitting an upright but helpless opponent, i.e. one suspended on the ropes.

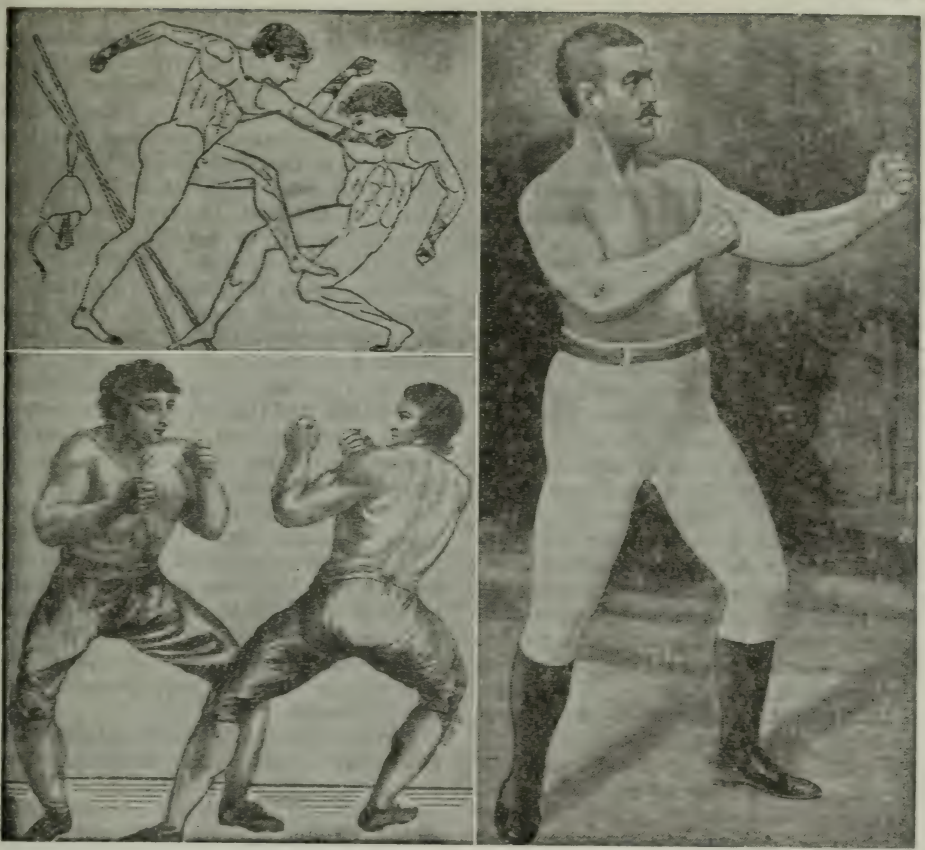
The Marquis of Queensberry Rules still prevail as the basic code in boxing contests. Besides prohibiting the practices mentioned, the rules mainly provide that (1) matches shall be conducted in a roped-in square area, called a ring, 24 feet on a side; (2) matches shall be divided into rounds of 3 minutes each, with a one-minute interval between rounds; (3) a contestant shall be declared the victor if his opponent, having become recumbent from exhaustion or otherwise, fails after a 10-second interval to resume an upright position; (4) a contestant resting on one knee shall be considered recumbent, or "down"; (5) seconds, or attendants, of the contestants shall not enter the ring during a round. Certain other rules already common in the sport, such as prohibitions against striking an opponent below the belt, seizing him by the hair, and striking a downed opponent, were retained in the general boxing code.

As boxing increased in popularity as a game and as a spectacle, additional regulations were incorporated into the general code governing both amateur and professional boxing (see PRIZE FIGHTING). Professional boxing has been subjected increasingly to control by the various States of the United States, particularly since 1920, when the New York State Legislature adopted the Walker Law, legislation designed to rectify certain



Acme

FAMOUS LONG COUNT, 1927. *Jack Dempsey, fighting to regain the heavyweight title, downed Gene Tunney in round 7, but delayed start of the count by failing to go to a neutral corner immediately. Tunney got up in 14 seconds, and finally won the fight.*



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BOXING HISTORY. *Left, top: Boxers shown on ancient Greek vase. Left, bottom: Boxers of 1790 (from old print). Right: John L. Sullivan, 1887, great American boxer.*

abuses and regularize the apportionment of prize money, and providing for a State Boxing Commission. In the next quarter of a century, numerous other States, several foreign nations, and a number of cities followed the example of New York. With few exceptions, notably in New York and Massachusetts, the boxing commissions of the States, as well as those of several nations, belong to the National Boxing Association, organized for the purpose of achieving a uniform approach to various aspects of professional boxing. The official regulations governing the conduct of professional boxing in most communities include, in addition to the Queensberry code, specifications regarding ring construction and ropes, set a minimum weight of 5 ounces for gloves, limit championship fights to a maximum of 15 rounds, define the role of referee and judges, and establish procedures for determining contests by points. Eight classifications of boxers, based on their weight, are universally recognized. These, with their respective maximum limits in pounds, are (1) Flyweight, 112; (2) Bantamweight, 118; (3) Featherweight, 126; (4) Lightweight, 135; (5) Welterweight, 147; (6) Middleweight, 160; (7) Light-Heavyweight, 175; and (8) Heavyweight, 176 and over. State codes for the control of professional boxing are generally uniform, differing chiefly with respect to the duration, in number of rounds, of contests, and the weight of gloves.

Amateur boxing ranks high as a sport among the youth of many countries, as evidenced by its inclusion among the contests of the Olympic Games (q.v.). In the United States, boxing competition has been encouraged among youth throughout most of the

20th century by the Amateur Athletic Union, an organization established in 1888. The sport has also become an integral part of the athletic program of most American colleges, many of which are represented in intercollegiate competition. Since 1928 the foremost event in amateur boxing has been the *Golden Gloves* tournaments, annual contests between the leading amateur boxers of Chicago, Ill., and New York City. Many outstanding professional boxers, including Joe Louis (q.v.), have been recruited from the ranks of Golden Gloves contestants. Amateur boxers are classified by weight according to professional standards. With certain important exceptions, the regulations governing the sport are identical with those of the professional code. The chief exceptions limit amateur bouts to three 3-minute rounds and specify (as a rule) that gloves may not weigh less than 8 ounces.

BOXING DAY, a popular term applied to December 26 in the British Empire. On that day the gentry were accustomed to give presents, generally of money, to their servants or others of humble life. These presents came to be known as *Christmas boxes.* Boxing Day is a legal bank holiday.

BOXTHORN, or MATRIMONY VINE, name applied to several spiny shrubs of the genus *Lycium* in the nightshade family, natives of Europe and w. North America and widely cultivated throughout the U.S. Boxthorn clambers like a vine, and is used to cover rocky slopes, fences, or walls, where it may be trained to a height of 30 or 40 ft. The leaves are alternate, simple, lanceolate, and, in some species, somewhat fleshy. The greenish-purple flowers appear in early summer, and the berries, which vary from orange to scarlet in the several species, develop in late summer.

BOX TURTLE, any turtle of the genus *Terrapene* in the family Testudinidae, the largest family of turtles. The plastron (lower shell) of these reptiles is divided transversely by a cartilaginous hinge, so that both the front and rear portions may be brought up against the carapace (upper shell). Box turtles assume this defensive position when frightened. So tight is the "box" thus formed that a straw cannot be placed between the two shells at any point.

These animals live entirely on dry land, and thus justify the common name box tortoise, although, unlike the true tortoises, they retain a trace of webbing between the toes of the hind feet. They feed on berries, insects, and worms. *T. carolina,* the common box turtle, is common east of the Mississippi R., north of lat. 34°. Several other species are found in eastern U.S. and Mexico. Turtles of a related genus, *Emys,* have a similar construction of the plastron, although with less mobility, and are called semi-box turtles.

BOYACÁ, town of the department of the same name, Colombia. The department lies in mountainous, heavily wooded country and has considerable mineral wealth. Its capital is Tunja (pop. in 1938, 16,597). The town of Boyacá is 25 miles s. of Tunja. Near it in 1819 took place the Battle of Boyacá (q.v.). Area of department, 12,138 sq.m.; pop. (1952 est.) 775,370. Pop. of town (1944 est.) 7660.

BOYACÁ, BATTLE OF, one of the decisive battles of the wars of independence waged against Spain by her South American colonies during the 19th century. It was fought on Aug. 7, 1819, near the town of Boyacá in Nueva Granada (now Colombia), South America, between a Spanish army of 500 and an army from Venezuela and Nueva Granada of about 2500, led by the South American soldier and patriot Simon Bolivar. The battle was won by the South Americans, whose victory laid the basis for the independence of Nueva Granada.

BOYCE, WILLIAM (1710–79), English composer, born in London, and trained as a chorister at Saint Paul's Cathedral, London. Between 1734 and 1769 Boyce held several musical posts, including those of organist at various London churches and master of the king's band. He was appointed composer to the Chapel Royal in 1736, and in that capacity wrote anthems and music for church services. In 1745 he began to compile collections of his songs and cantatas under the title *Lyra Britannica,* which eventually numbered six volumes, and in 1750 he composed the music for the *Secular Masque* (see MASQUE) of the English poet John Dryden. Increasing deafness compelled Boyce to give up most of his work after 1769, and until 1778 he devoted himself to the compilation and editing of the second and third volumes of *Cathedral Music,* a collection of compositions written between the 16th and 18th centuries (first volume by Maurice Greene, 1760). *Cathedral Music* was the standard work for use in English cathedrals for a century after its publication. Boyce's instrumental compositions were revived with considerable success in the 20th century; they include eight symphonies and twelve sonatas for two violins and bass. Among his other compositions are several an-

thems, notably "O, Where Shall Wisdom Be Found" and "By the Waters of Babylon", which are still frequently performed.

BOYCOTT, organized refusal by a combination of persons to trade or associate with any individual, corporation, or organization deemed hostile or dangerous to the collective welfare of the group. In most boycotts the initiators attempt to enlist the support of friendly or neutral sections of the population. The name is derived from that of Captain Charles Boycott (1832–97), a British land agent in Ireland whose eviction policies incited the Irish people, in 1880, to subject him to various forms of reprisal and an organized protest movement. The term and method quickly spread to all parts of the world. In the English legal system, boycotts are regarded as lawful, except when such actions are accompanied by violence. American jurisprudence generally lacks consistency on the question; the United States Supreme Court has ruled on several occasions that boycotts are illegal when in restraint of trade. Boycotts are frequently utilized by American labor organizations during disputes with employers. Prior to World War II boycotts were employed by democratic groups in various countries for political purposes, notably against goods manufactured in fascist Germany and in Japan.

BOYD, James (1888–1944), American writer, born in Harrisburg, Pa., and educated at Princeton University, and at Cambridge University in England. His realistic, historical novel *Drums* (1925) describes the adventures of the son of a North Carolina plantation owner in the American Revolution, and his novel *Marching On* (1927) depicts the tragic life of the descendants of the characters in *Drums* during the Civil War. Boyd's other works include *Long Hunt* (1930), a novel about the Western frontier; *Roll River* (1935), a novel about his native city; *Bitter Creek* (1939); *One More Free Man* (a play, 1941); and *Eighteen Poems* (1944).

BOYDEN, Seth (1788–1870), American inventor, born in Foxboro, Mass. Beginning at the age of 21, he perfected a wide variety of inventions, showing an ingenuity which justified Edison's calling him "one of America's greatest inventors". His first invention was a machine for making nails. He then turned his attention to the leather business, in which he engaged beginning in 1815, after inventing a machine for splitting leather. In 1819 he invented patent leather.

In 1831 he developed a process for making malleable cast iron. Boyden then turned to steam engines, and manufactured both locomotives and stationary engines. He developed the cut-off type of throttle and built the first locomotives with straight axles and with cylinders outside the frame. After making an unprofitable trip to California during the gold rush, he returned east and settled on a farm in New Jersey, where he produced new and improved varieties of strawberries.

BOYD ORR. See Orr, John Boyd.

BOYER, Jean Pierre (1776–1850), Haitian soldier and statesman, born a free mulatto in Port-au-Prince, and educated in France. He began his military career in 1792 in the army of Haiti, which was then under French control. In 1802 he joined a French military force sent to put down the rebellion led by the Haitian revolutionist Toussaint L'Ouverture (see Toussaint L'Ouverture) against French rule. Because France sought to re-establish slavery in Haiti, Boyer soon sided with his countrymen and played an important part in driving the French from the country. After a civil war between two native factions, in 1818 Boyer became president of the republic of Haiti. Within three years he brought all of Haiti and Santo Domingo under his rule. By agreeing (1825) to pay France an indemnity of 150,000,000 francs (later reduced to 60,000,000 francs), he secured that country's recognition of the independence of the republic. Boyer improved agricultural and cultural conditions in his country, but his arbitrary rule and the heavy taxation made necessary by the indemnity aroused great discontent. The unrest culminated in an insurrection against him in 1843. He fled to Jamaica, and later to France, where he died.

BOYLE, Kay (1903–), American writer, born in St. Paul, Minn., and educated at Ohio Mechanics Institute. From 1922 to 1941 she lived in Europe, establishing her literary reputation by contributions to American magazines published abroad. She returned to America in 1941. Among her works are *Wedding Day and Other Stories* (1931), *Plagued by the Nightingale* (1931), *Gentlemen, I Address You Privately* (1933), *The White Horses of Vienna* (1936), *Primer for Combat* (1942), *Avalanche* (1943), *A Frenchman Must Die* (1946), *Thirty Stories* (1946), *1939* (1948), *Smoking Mountain* (1951), and *Seagull on the Step* (1955).

BOYLE, Robert (1627–91), English scientist, born at Lismore Castle, Ireland. He was a son of Richard Boyle, 1st Earl of Cork, and was educated at Eton and in

Geneva. Returning from the continent, he settled in England and devoted himself to scientific research. He believed in the necessity of objective observation in research, and is considered one of the founders of modern scientific method. In 1645 he helped to found the Philosophical College, which, after the Restoration, became the Royal Society of London for Improving Natural Knowledge (q.v.).

Boyle improved the air pump, and in connection with his work with gases formulated the law relating gas pressure and volume which bears his name (see BOYLE'S LAW). In the field of chemistry, he observed that air is absorbed in the process of combustion and that metals gain weight when they oxidize.

As a devout Christian, Boyle felt the need to study the scriptures in the original, and for this purpose learned various Oriental languages. He was a supporter of missionary work in India, and paid for the translation and publication of the Bible in Gaelic. Among his works are *The Sceptical Chemist* (1661), *Origin of Forms and Qualities According to the Corpuscular Philosophy* (1666), and *Discourse of Things Above Reason.*

BOYLE'S LAW, a law of physics which states that when a gas is at a constant temperature the product of the pressure and volume of a given mass remains constant. The law was formulated by Robert Boyle and discovered independently by a French physicist, Edme Mariotte. Hence it is sometimes called the Law of Boyle and Mariotte.

Boyle's law is exact only over a limited range of temperature, pressure, and volume for any given gas, since it does not take into account the volume of the gas particles themselves nor their mutual attraction. A modified formula developed by J. D. van der Waal, a Dutch physicist, comes far closer to defining the actual behavior of gases. It is

$$\left(P + \frac{A}{V^2}\right)(V - B) = RT$$

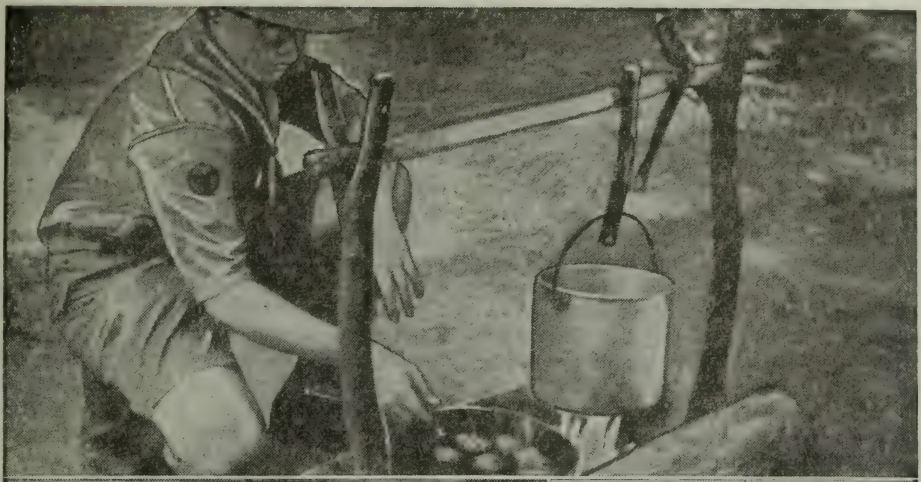
In this equation, P is the gas pressure, $\frac{A}{V^2}$ is an added pressure caused by molecular attractions, V is the total volume, B is the volume of the particles themselves, R is a universal constant and T is the absolute temperature. When volumes are large, as is the case at low pressures or high temperatures, this equation reduces essentially to the Boyle's-Law equation: PV = RT. See GAS, PROPERTIES OF; KINETIC THEORY.

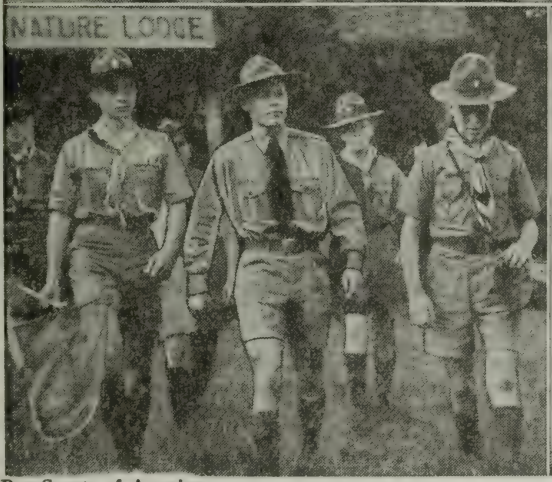
BOYNE, river of Ireland, rising in the Bog of Allen, County Kildare, Republic of Ireland, and flowing N.E. past the towns of Trim, Navan, and Slane in County Meath, and Drogheda in County Lough. It empties into the Irish Sea 4 m. below Drogheda. The river is 70 miles long and is navigable by shallow-draft vessels as far as Drogheda. In 1690, during the English Revolution, a decisive battle, known as the Battle of the Boyne, took place on the banks of the river.

BOYNE, BATTLE OF THE, battle of the English Revolution, fought on July 1, 1690, on the banks of the Boyne River, Ireland, between the troops of the exiled British king James II and those of the newly crowned British king William III. After the Protestant William III and his wife Mary had been proclaimed joint sovereigns (1689) by Parliament, the deposed Roman Catholic monarch James II, who had been in exile in France, landed troops in Ireland. William III led an army against him, and the two forces, about 35,000 Protestants and about 25,000 Catholics, met at the Boyne. The Protestants routed the enemy, and James fled back to France. William's forces defeated remnants of the Catholic army in the next year. As a result of the Protestant victory Ireland's status as an English colony remained unchallenged for more than a century and Roman Catholicism lost its final bid to become the official religion of Great Britain. The anniversary of the Battle of the Boyne is celebrated, particularly by members of the Protestant Irish society called Orangemen (q.v.), on July 12.

BOY SCOUTS, name of an international movement to develop good character and good citizenship among boys. The movement is nonpolitical, nonmilitary, and nonsectarian, and is sponsored by government, religious, civic and labor bodies with which it cooperates. (See BOY SCOUTS OF AMERICA.) Scouting is included in the curriculums of the schools of a number of countries, notably of England.

The movement began in England as a result of the efforts of General Robert Stephenson Smyth, who later became Baron Baden-Powell (q.v.). In 1907 he organized an experimental camp at Brownsea Island, England, and, in 1908, following the appearance of his *Scouting for Boys,* he inaugurated the Boy Scout movement. In formulating its program, Baden-Powell included principles from the programs of two American boys' organizations in existence at that time: Sons of Daniel Boone, organized by Daniel Carter Beard (q.v.); and Woodcraft Indians, organized by Ernest Thompson Seton (q.v.).





Boy Scouts of America

ACTIVITIES OF AMERICAN BOY SCOUTS

Top: Cooking outdoors. Above: Setting out on a nature-study hike, with butterfly net. Above, right: Practicing flag-signal code. Right: Starting a fire by primitive method.

There are generally three age groups or divisions in Boy Scout organizations: *Cubs,* from 8 or 9 years of age to 11; *Boy* or *Sea Scouts,* from 12 to 15 or 17; and older Scouts, designated differently in various countries.

National organizations are autonomous but co-operate through the International Scout Bureau located in London. They meet in biennial international conventions, and come together every fourth year in international rallies, called *jamborees.* The Boy Scouts in 1952 had 5,561,993 members in 54 countries.

BOY SCOUTS OF AMERICA, an organization, incorporated in 1910 and chartered by Congress in 1916, to develop the character of boys and train them for the duties of adult life by influence brought to bear in their work and play. Its national constitution declares the intention: "to promote the ability of boys to do things for themselves and others, to train them in scout craft, and to teach them patriotism, courage, self-reliance, and kindred virtues." Each boy, on joining the organization, takes the Scout Oath, admonishing him to keep himself "physically strong, mentally awake, and morally straight". The Scout Law requires him to exert such qualities as trustworthiness, loyalty, helpfulness, friendliness, courtesy, kindness, obedience, cheerfulness, thrift, bravery, cleanliness, and reverence. The movement is nonsectarian and without military or political connection.

The organization encourages boys to carry on vigorous outdoor activities. Camping is a regular part of the Scout program, which also includes conservation, forestry, and farm work; and aid in a variety of community services, including safety-first campaigns and traffic-control. During World War II the Boy Scouts participated in salvage campaigns and other wartime civilian activities. The program also stresses the development among Boy Scouts of skill in woodcraft, swimming, first aid (q.v.), signaling, and other skills. The Scout Motto is *Be Prepared.*

The Boy Scouts of America are administered by a National Council which charters Local Councils. Local scouting organizations are sponsored by churches, schools, and other bodies, which are represented in the Local Councils.

Cubs, boys of 8 through 10 years of age, are organized into *Packs* which consist of smaller units called *Dens.* The Scout program for Cubs emphasizes organized activities in and around the boys' homes.

Boy Scouts, aged 11 through 13, are grouped into *Troops* with a maximum of 32 members to a Troop. *Troops* are divided into *Patrols* with a maximum of eight boys. *Troops* are led by Scoutmasters who must be adult American citizens and who are assisted by Boy Scout Leaders. Scoutmasters are chosen by local sponsoring committees with the approval of the National Council. In small communities where there are not enough boys to constitute a Troop, two to eight boys may form a *Neighborhood Patrol*; a single boy in a community may become a Scout and co-ordinate his activity with larger Scout bodies by mail.

After taking the Scout Oath and meeting other qualifications a boy becomes a *Tenderfoot.* After further training and successfully passing a number of tests he becomes successively a *Second Class, First Class, Star, Life,* and *Eagle* Scout. Scouts 14 years of age automatically become *Explorers,* and are eligible to join an *Explorer Post,* a *Post Ship,* or an *Air Squadron.*

The Boy Scouts of America publishes about 500 handbooks, technical pamphlets on Scout activities, and periodicals, including *Scouting,* a monthly periodical for the guidance of Scout Leaders, and *Boys' Life,* a magazine for all boys. The national headquarters are located in New Brunswick, N.J. The national membership in 1955 was 3,783,131. See also Boy Scouts; Girl Scouts of the United States of America.

BOZ, pen name of the English writer Charles Dickens (q.v.). It was used by him on contributions made to the periodical *Morning Chronicle* and in writing the sketches which afterward became known as *Pickwick Papers. Sketches by Boz,* a collection of some of Dickens' first literary efforts, appeared in book form in 1836–37.

BOZEN. See Bolzano.

BRABANT, province of Belgium, situated in the central part of the country. For the most part the terrain of Brabant consists of an undulating plain. The province is traversed by the Dyle, Demer, and Senne rivers. Agriculture is a leading industry, and the chief crops include cereals and beets. Other principal industries are sandstone and porphyry quarrying, and the manufacture of textiles and a wide variety of other products. Brussels (q.v.) is the administrative center and largest city. Other important cities are Louvain, Ukkel, and Vorst.

For the early history of Brabant, see Brabant, Duchy of. The Treaty of Münster in 1648 between the Holy Roman emperor Philip IV and the Dutch provinces of the Austrian Netherlands established the independence of the latter as the Republic of the United Provinces, and the northern part of the former duchy of Brabant was ceded to the new state (see North Brabant); the southern and larger part of the former duchy was divided by the Hapsburgs into the provinces of Antwerp and Brabant. In 1795, during the French Revolutionary Wars, Brabant was incorporated into France. By the terms of the Treaty of Vienna (1815), following the defeat and exile of Emperor Napoleon I, it was included in the Kingdom of the Netherlands.

Subsequently, as a result of the revolution of 1830, Brabant became a province of the independent Kingdom of Belgium. German troops occupied the province from 1914 to 1918, during World War I. German troops again occupied the province from 1940 to 1944, during World War II. Area, 1267 sq.m.; pop. (1952 est.) 1,849,087.

BRABANT, DUCHY OF, former duchy comprising the present-day provinces of North Brabant, the Netherlands, and of Antwerp and Brabant, Belgium. In the 1st century B.C. the region later known as Brabant was inhabited by a Celtic-Teutonic people. The region became a possession of the Franks in the 5th century A.D. On the disintegration (9th century) of the Frankish empire it was included in the duchy of Lorraine. From 959 to 1190, when it became the duchy of Brabant, the region formed part of the duchy of Lower Lorraine. Under the guidance of the rising mercantile class Brussels, Antwerp, and other cities of the duchy began to figure prominently during the 13th century in a movement to curtail the privileges of the nobility. The Charter of Cortenberg (1312), the burghers' first important victory, granted various concessions to the people, including limitations on taxes. In 1354 Duke John III of Brabant was forced to promulgate the charter known as La Joyeuse Entrée, which granted further powers to the people.

On the death (1430) of Duke Anthony, Brabant was inherited by Philip III, Duke of Burgundy. The Burgundian possessions subsequently passed to Philip's granddaughter Mary. In February, 1477, representatives of towns in Brabant, Flanders, Hainault, and Holland met in the Flemish city of Ghent and compelled Mary to sign the *Great Privilege,* giving the people of her domain a voice in the raising of taxes, the declaring of war, and the marriage of their sovereign. In the same year Mary married Archduke Maximilian of Austria, and Brabant, together with the other territories of the House of Burgundy, passed into the possession of the House of Hapsburg. The territory of the duchy of Brabant was included in the Austrian Netherlands.

BRABANT, NORTH. See NORTH BRABANT.

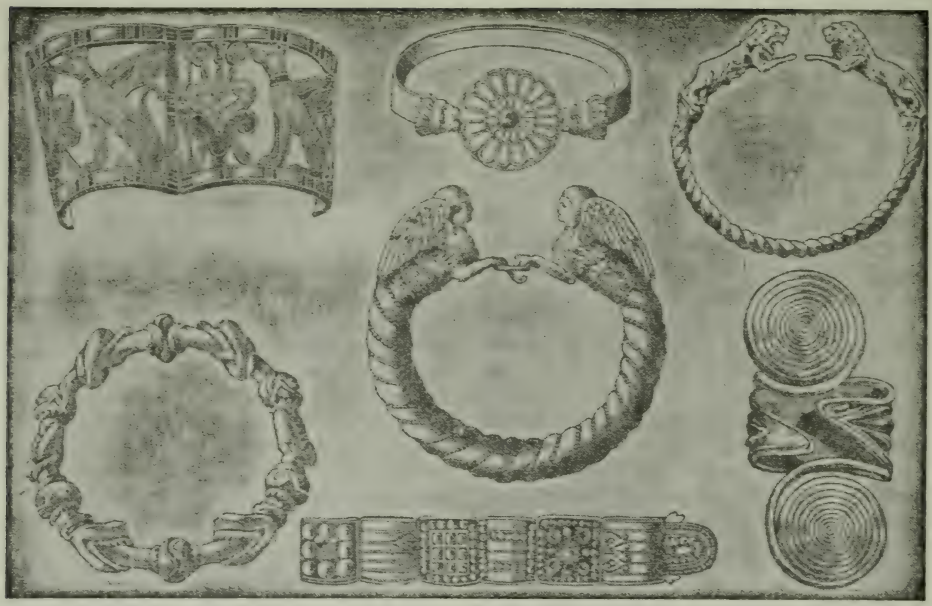
BRACARA AUGUSTA. See BRAGA.

BRACCIOLINI, POGGIO. See POGGIO BRACCIOLINI, GIOVANNI FRANCESCO.

BRACELET, ornament worn encircling the arm or wrist, sometimes termed armlet when worn on the arm. The bracelet has been used in every nation, both barbaric and civilized, from the earliest periods of history to modern times. Ornaments of this kind are frequently mentioned in the Old Testament, and evidence exists that metal armlets were worn by the early kings of Egypt as symbols of rank. Spiral armlets which covered the entire forearm were worn by German and Scandinavian warriors during the Bronze Age, for protective as well as decorative purposes. Etruscan jewelry included bracelets consisting of hinged panels. The women of ancient Greece wore bracelets of various designs, including a type which represented a coiled serpent. Bracelets were also a common form of adornment among the women of ancient Rome, and were conferred upon Roman soldiers for valor in battle. During the period of Celtic culture the art of Britain developed several types of bracelets, elaborately decorated and usually of bronze. Later in the period, silver bracelets of intricate design were made in northern Europe. The bracelet continues to be a favorite form of jewelry among women of all countries, modern styles often being copies of ancient designs. During World War II large numbers of soldiers of various nations wore "identification bracelets" on which the name and army serial number of the wearer were inscribed.

BRACHIOPODA, a class of animals comprising, with the Bryozoa and sometimes with the Phoronidea, the phylum Molluscoida, although some zoologists now classify these three groups as separate phyla. They were formerly classified in the same phylum with mollusks, and the presence of two shells gives them a superficial resemblance to true bivalves (Lamellibranchia); they differ from mollusks, however, in that, among other features, the shells lie dorsally and ventrally instead of right and left, and the enclosed organism has an armlike appendage at each side of the mouth.

Brachiopoda are most notable because in the earliest geological times they were a dominant type; but since the close of the Paleozoic Age they have been steadily decreasing. More than 4000 species are known, but more than 95 percent are extinct and exist only as fossils. Most living Brachiopods are small, less than an inch across, but some of the extinct forms were 6 inches across. All living species are marine, and there is every reason to believe the same is true of the extinct species. Existing species are found in water of moderate depth, sometimes down to 250 fathoms. They are generally grouped in two orders: the Articulata, or Testicardines, in which the shell-valves are hinged, and the Inarticulata, or Ecardines, without hinges.



EARLY BRACELETS. *Top, left to right: Egyptian; Assyrian; Greek. Center: Greco-Roman. Bottom, left to right: Gaulic; Etruscan; barbaric Italian (post-Roman).*

BRACHIOSAURUS, one of the largest of the dinosaurs (see DINOSAURIA), measuring about 80 feet in length and weighing about 35 tons. It is a member of the suborder Sauropoda, heavy, amphibious dinosaurs with the front legs slightly longer than the rear. The slender, pencil-like teeth of the brachiosaurus were not adapted for ordinary browsing and it is assumed that these animals fed on some form of aquatic growth. Fossil remains of the brachiosaurus from the Jurassic period have been found in western U.S. and eastern Africa; among them a humerus bone 6 feet long, giving an indication of the gigantic size of the reptiles.

BRACHYURA. See CRAB.

BRACKEN. See BRAKE.

BRACKET FUNGI, fungi of the family Polyporaceae, belonging to the same order as the mushrooms, which grow in the form of shelves or brackets on tree trunks or stumps. The soft bodies of these fungi become woody as they grow old. They belong to the class Basidiomycetes (q.v.).

BRACTON or **BRATTON** or **BRETTON,** HENRY DE (d. 1268), English ecclesiastic and jurist, archdeacon of Barnstaple and chancellor of Exeter Cathedral (1264). He is memorable as one of the earliest writers on English law, his *De Legibus et Consuetudinibus Angliæ* being the first attempt at a systematic treatment of the body of English law.

BRADDOCK, borough of Allegheny Co., Pa., on the Monongahela R., on the eastern outskirts of Pittsburgh. It was settled in 1795 on the site of Braddock's ambush and defeat (see BRADDOCK, EDWARD), and incorporated in 1867. The iron and steel industry, attracted to the borough because of the availability of coal and water power, was firmly established there by 1870. The Bessemer steel process was perfected there, in the Carnegie mills; and the borough was the site of the first Carnegie free public library. In Braddock are blast furnaces, foundries, and factories producing steel rails, chain, wire, pumps, and wall plaster. Pop. (1950) 16,488.

BRADDOCK, EDWARD (1695–1755), British soldier and commander in chief of British forces in America, born in Scotland. In 1755, during the French and Indian War (q.v.), he led an expedition against Fort Duquesne, a French stronghold on the site of present-day Pittsburgh. With a force of twelve hundred picked men, regulars and provincials, he reached the Monongahela River, a branch of the Ohio River, on July 8. Disregarding the warnings of his American officers that the enemy might launch a surprise attack, he advanced to a point about 7 m. from the fort,

where he was ambushed by Indians and the French. Complete rout ensued. The survivors, less than half of the command, were led to safety by Colonel George Washington, one of General Braddock's aides and later first President of the United States. Braddock was mortally wounded and died a few days later.

BRADFORD, city in McKean Co., Pa., about 70 miles s. of Buffalo. At first called Littletown, Bradford acquired its present name in 1854 and was incorporated as a city in 1879. Since 1876 Bradford has been one of the most important oil centers of Pennsylvania. The chief industries are the production and refining of oil, and the manufacture of pipe couplings, paper boxes, and brick. The city has an airport, and is served by three railroads. Pop. (1950) 17,354.

BRADFORD, county borough and city of West Riding, Yorkshire, England, situated on a tributary of the Aire R., 191 miles N.N.W. of London. It is the chief British worsted-manufacturing and wool-trading center. Other manufactures include alpaca, mohair, cotton, silk, velvet, and mixed cotton and silk goods, and textile machinery. Coal and iron mines and freestone quarries are located in the vicinity. Among the city's educational institutions are a number of technical schools, notably a mechanics' institute founded in 1832. Outstanding points of interest are St. Peter's Cathedral, a 15th-century structure; the town hall, a medieval edifice with campanile tower and carillon chimes; and the Cartwright Memorial Hall, containing an art gallery and museum. The last-named building honors the memory of the English inventor Edmund Cartwright, whose invention of the combing machine and power loom contributed to the city's industrial development. A settlement occupied the site of Bradford in Anglo-Saxon times. During the Norman Conquest (1066) it suffered almost complete destruction. In the process of its rebuilding, the town became an important market center, noted for its trade in wool. By the end of the 14th century a mill for fulling woolen cloth was in operation. The woolen trade was supplemented, early in the 18th century, by worsted manufacturing, which increased rapidly with the development of steam power. Pop. (1953 est.) 286,600.

BRADFORD, GAMALIEL (1863–1932), American author, born in Boston, Mass., and privately educated. He specialized in the writing of biographies in which, by means of a method of psychological analysis he termed "psychography", he sought to abstract out of all the known actions and events of the life of his subject a valid and consistent characterization. Among his writings were *Types of American Character* (essays, 1895), *Lee, the American* (1912), *Confederate Portraits* (1914), *Union Portraits* (1916), *Damaged Souls* (1923), *Darwin* (1926), *Life and I* (autobiography, 1928), *Daughters of Eve* (1930), and *The Quick and the Dead* (1931).

BRADFORD, ROARK (1896–1948), American writer, born in Lauderdale Co., Tenn. He was a reporter for newspapers in Southern cities (1920–23) and an editor of the New Orleans *Times Picayune* (1924–26). From 1926 he devoted himself to creative writing. He is known for his stories of Negro life, many of which are based upon a folk interpretation of the Bible. His *Ol' Man Adam an' His Chillun* (1928) was the basis for Marc Connelly's play *The Green Pastures,* which won the Pulitzer Prize (q.v.) in 1930. Other books by Bradford include *Ol' King David an' the Philistine Boys* (1930) and *John Henry* (1931), a story of the legendary hero of that name, which he dramatized in 1940 with music by Jacques Wolfe. Bradford also wrote the play *The Three-Headed Angel* (1937).

BRADFORD, WILLIAM (1590–1657), one of the Pilgrim Fathers, colonial governor, and historian, born in Austerfield, Yorkshire, England. In 1606 he joined the Brownists (q.v.) and three years later, in search of freedom of worship, went with them to Holland, where he became an apprentice to a silk manufacturer. He sailed on the *Mayflower* in 1620, and after his arrival in the New World became one of the founders of Plymouth Colony. In April, 1621, he succeeded John Carver as governor of the colony, serving until 1632, and was re-elected on four subsequent occasions, his last term extending from 1645 to 1656. He wrote *History of Plymouth Plantation* (published for the first time in 1856), upon which, directly or indirectly, has been based much of the present knowledge of the Pilgrims. The manuscript of this work was stored for many years in the tower of the Old South Church, but disappeared during the Revolutionary War. It was found in the Fulham Library, England, in 1855, and in 1898 was returned to the United States and deposited among the Massachusetts archives.

BRADFORD, WILLIAM (1663–1752), American printer, born in Leicester, England. With other Quakers he emigrated to America in 1682. In 1685 he established in Philadelphia the first printing press in the Middle Colonies, and in 1690 he with two others built a paper

mill on the Schuylkill. In 1691 he was arrested and tried by the authorities for "seditious libel"; his press and publications were confiscated, but the jury refused to convict him. He moved to New York in 1693 and in the same year established the first press in that Colony. On Oct. 16, 1725, he began the first newspaper in New York City, and the fourth in America, *The New York Gazette*. For years he was the only printer in the Colony and for 50 years held the office of public printer. He had two sons, one of whom, ANDREW SOWLES BRADFORD (1686–1742), was a prosperous publisher in Philadelphia.

BRADLEY, JAMES (1693–1762), English astronomer, born at Sherborne, Gloucestershire. In 1729 he published his theory of the aberration of the fixed stars, containing the important discovery of the aberration of light. At about the same time he discovered the phenomenon of nutation, but delayed publication until 1748, during which time he had an opportunity to check the discovery by careful measurements throughout a lunar cycle of 18½ years. In 1742 he was appointed Astronomer Royal to succeed Edmund Halley at the Greenwich Observatory. The extraordinarily precise observations which he made there were not published until 1798–1805, and were even then of great usefulness, especially to Friedrich Bessel who published in 1818 a catalogue of the positions of 3222 stars computed from Bradley's observations.

BRADLEY, KATHERINE HARRIS. See FIELD, MICHAEL.

BRADLEY, OMAR NELSON (1893–), American soldier, born in Clark, Mo., and educated at the U.S. Military Academy. He was commissioned a 2nd lieutenant in the U.S. Army in 1915. By the end of World War I he had advanced to the rank of major. In the period between World Wars I and II Bradley was on duty at various army posts, attended successively the Infantry School, the Command and General Staff School, and the Army War College, and served on the general staff. He attained the rank of major general in 1942, shortly after the United States entered World War II. In February, 1943, he assumed command of the U.S. 2nd Corps, which was then engaged in the Allied campaign in North Africa. His leadership of the 2nd Corps contributed substantially to the American victories at Tunis and Bizerte. Later in 1943 he participated in the invasion of Sicily and was promoted to the rank of lieutenant general.

In January, 1944, Bradley became commander of the U.S. ground forces being assembled in Great Britain for the invasion of Europe. He led the U.S. 1st Army during the initial assault on Normandy and throughout the ensuing Normandy campaign. Placed in command (August, 1944) of the newly created U.S. 12th Army Group, he shared responsibility with the British general Bernard L. Montgomery for Allied ground operations against Germany throughout the remainder of the war. The only severe reverse suffered by his forces in this period occurred during the German counteroffensive (December, 1944) in the Ardennes (see BATTLE OF THE BULGE). He was made a full general in March, 1945.

In June, 1945, following the Allied victory over Germany, Bradley was appointed head of the U.S. Veterans Administration. He improved the services of this agency through a number of constructive reforms. Named by President Harry S. Truman to succeed General of the Army Dwight D. Eisenhower as chief of staff, Bradley returned to active duty on Dec. 1, 1947. He assumed his new position on Feb. 7, 1948. From 1949 to 1953, when he retired, he was chairman of the Joint Chiefs of Staff, a body consisting of the chiefs of staff of the Army, Navy, and Air Force. He wrote *Soldier's Story* (1951).

BRADSTREET, ANNE (1612?–72), American poet, daughter of Thomas Dudley and wife of Simon Bradstreet, governors, at different times, of Massachusetts Bay Colony. She was born probably in Northampton, England, and came to the Massachusetts colony with her husband in 1630. There, in moments snatched from her domestic chores, she wrote verse, becoming the first woman in the colonies to write poetry in the English language. She was called "The Tenth Muse" after the title in her volume of poems, published in 1650 in London. See AMERICAN LITERATURE.

BRADY, JAMES BUCHANAN (1856–1917), American financier and philanthropist, born in New York City. After a period as a bellboy in a New York hotel, he held various positions with the New York Central Railroad. He became a statesman of railway equipment in 1879 and thereafter he accumulated a substantial fortune. His predilection for expensive jewelry made him famous as "Diamond Jim", and during the "Gay Nineties" era in New York City he was one of the most colorful figures in Broadway night life. In 1912 he endowed the James Buchanan Brady Urological Institute of Johns Hopkins Hospital, Baltimore. He bequeathed several million dollars to Johns Hopkins Hospital and to New York Hospital, New York City.

BRADY, Mathew B. (1823?–96), American photographer. In 1842, after experimenting for three years with the daguerreotype process and with other discoveries in the realm of photography, Brady opened a portrait studio in New York City. During the Civil War, Brady and a number of assistants established a studio in a wagon, traveled with the Union armies, and despite the difficulties and risks involved, took more than 7000 pictures of the fighting and of soldiers engaged in their daily activities. Brady's collection, a part of which was purchased by the Federal government in 1875, is unique in the annals of American photography, as an accomplishment by an individual, both for its magnitude and its realism. It is the basis of pictorial histories of the Civil War.

BRADY, William A. (1863–1950), American theatrical producer and manager, born in San Francisco. Early in his career he managed the pugilists James Jeffries and James Corbett. He was proprietor of the Playhouse in New York City and president of the National Association of the Motion Picture Industry (1915–30). Many notable actors and actresses appeared under his management. Among them were Helen Hayes; Douglas Fairbanks; Brady's second wife, Grace George; and his daughter, Alice Brady. Among Brady's productions were *Uncle Tom's Cabin* (1901), *Way Down East* (1903), *The Pit* (1904), *Trilby* (1905), *Bought and Paid For* (1911), *Street Scene* (1929), and *Mademoiselle* (1933).

BRAGA (anc. *Bracara Augusta*), archiepiscopal see and capital of an administrative district of the same name and of Minho Province, Portugal, situated about 35 miles N.N.E. of Oporto. It is an industrial center, with plants engaged in the manufacture of hats, firearms, cutlery, textiles, and gold and silver articles. Points of interest include the ruins of a Roman temple, amphitheater, and aqueduct. The cathedral, built in the 12th century, contains relics relating to the early history of Portugal. Count Henry of Burgundy, father of the first king of Portugal, is buried in the cathedral. The archiepiscopal palace contains a notable library. Standing on a neighboring hill is the church of Dom Jesus do Monte, where thousands of pilgrims gather at Whitsuntide. Originally the capital of the Bracarenses, a Celtic tribe, Braga was later held successively by the Romans, Suevi, Visigoths, and Moors. King Ferdinand of Castile and León expelled the Moors in 1040. The rulers of Portugal resided at Braga from 1093 to 1147. Area of district, 1054 sq.m.; pop. (1950) 541,377. Pop. of town (1950) 32,624.

BRAGANZA (Port. *Bragança*), the name of the former royal family of Portugal and Brazil, and of the ducal house from which they were descended; it is derived from the seat of the duchy, the city of Bragança. The first Duke of Braganza, given that title in 1442, was Alfonso (d. 1451), illegitimate son of King John (João) I of Portugal. His descendant Duke John (d. 1583) was an unsuccessful candidate for the throne against Philip II of Spain in 1580; a grandson of this duke became King John IV (q.v.) of Portugal upon the liberation of that country from Spain in 1640. Thereafter the heirs to the Portuguese throne were given the title of Duke of Braganza. John IV was succeeded by his two sons, Alfonso VI and Pedro II, after whom the rulers, in successive generations, were the descendants of Pedro: John V, Joseph Emanuel (José Manuel), Maria I (who married her uncle, known thereafter as Pedro III), and John VI (q.v.). The last was ousted by Napoleon I and removed his court to Brazil in 1807, ruling Portugal from that country from 1814 until his return to Lisbon in 1821. The son of John VI was made first emperor of the independent state of Brazil as Pedro I; on becoming Pedro IV of Portugal he resigned in favor of his daughter, who became Queen Maria II. Thereafter, Portugal was ruled in successive generations by Louis (Luis), Carlos I, and Manuel II; the last was deposed in 1910, ending the line of Braganza in Portugal. The house survived only one generation in Brazil; Pedro II (q.v.), son of the first emperor, was deposed in 1889.

BRAGG, Braxton (1817–76), American soldier, born in Warren Co., N.C., and educated at the United States Military Academy. He served in both of the Seminole wars (1837–39 and 1841–42), and won several promotions for gallant and distinguished conduct during the Mexican War (1846–48). He resigned his commission in 1859 to enter private enterprise. Shortly after the outbreak of the Civil War, he joined the Confederate army as a brigadier general. He was soon promoted to the rank of major general and given command of the 2nd Corps of the Army of the Mississippi, under General Albert Sidney Johnston. After Johnston's death he succeeded to his command, with the rank of general. He replaced General Pierre Toutant de Beauregard as commander of the Army of the Tennessee

in June, 1862. Invading Kentucky in August, 1862, he nearly succeeded in an attempt to take Louisville, but was compelled to withdraw into Tennessee. At the battle of Murfreesboro, or Stone River, he was defeated by Union forces under General William Rosecrans, and fell back to Tullahoma. He was skillfully maneuvered out of Tullahoma by Rosecrans early in September, 1863. However, he inflicted a decisive defeat on Rosecrans in the battle of Chickamauga (Sept. 19–20). Soon afterward he was defeated by General Ulysses S. Grant in the three-day battle of Chattanooga (Nov. 23–25), and he was replaced by Lieutenant General William J. Hardee on Dec. 2. On Feb. 24, 1864, he was summoned to Richmond and made military adviser to the president of the Confederacy, Jefferson Davis. Bragg was placed in command of the Department of North Carolina in November, and led an unsuccessful expedition into Georgia against General William Tecumseh Sherman, then on his march to the sea. In February, 1865, he was assigned to duty with the Army of the Tennessee under General Joseph Eggleston Johnston and remained with that officer until the surrender of his army. After the war Bragg was for some time chief engineer for the State of Alabama.

BRAGG, Sir William Henry (1862–1942), British physicist, born in Wigton, Cumberland, and educated at Trinity College, Cambridge. In Australia from 1886–1908 he was professor of physics at the University of Adelaide. He moved to England on his appointment as Cavendish professor of physics at the University of Leeds, 1909–15. Jointly with his son, William Lawrence Bragg (q.v.), he received the Barnard Gold Medal of Columbia University (1914), and the Nobel Prize in physics for 1915. Both shared in other honors for their pioneer work in the study of crystal structure by Roentgen rays. From 1915 to 1923, he held the chair of physics in the University of London. He was director of the Royal Institution of Great Britain and after 1923 he was Fullerian professor of chemistry there, and director of the Davy-Faraday Research Laboratory. In 1928 he was elected president of the British Association for Advancement of Science, and from 1935 to 1940 he was president of the Royal Society. He was knighted in 1920 and awarded the Order of Merit in 1931. During World War I he acted in an advisory capacity to the British Admiralty, especially with regard to the problem of submarine detection, and during World War II he was head of a food committee. He wrote *Studies in Radioactivity* (1912), *X-Rays and Crystal Structure* (with his son, 1915), *Concerning the Nature of Things* (1925), *Craftsmanship and Science* (1928), *The Universe of Light* (1933).

BRAGG, Sir William Lawrence (1890–), British physicist, son of the British physicist Sir William Henry Bragg, born in Adelaide, Australia, and educated at Adelaide and Cambridge universities. He was a lecturer in natural sciences at Cambridge from 1914 to 1919, and then became professor of physics at Victoria University, Manchester. He shared with his father the Barnard Medal of Columbia University in 1914 and the Nobel Prize in 1915, for their joint work on crystal structure.

After serving as director of the National Physical Laboratory (1937–38), Bragg was Cavendish professor of physics at Cambridge (1938–53). Subsequently he filled posts at the Royal Institution: he became Fullerian professor of chemistry in 1953 and director of the Davy-Faraday Laboratory in 1954. Bragg was made a Fellow of the Royal Society in 1921 and was knighted in 1941. His works include *X-rays and Crystal Structure* (with Sir W. J. Bragg, 1915), *The Crystalline State* (1934), *Electricity* (1936), and *Atomic Structure of Minerals* (1937).

BRAHE, Tycho (1546–1601), celebrated Danish astronomer, born at Knudstrup in Skåne, south Sweden, then a province of Denmark. His uncle sent him to study law at the University of Leipzig in 1562; but Brahe, while his tutor slept, busied himself nightly observing the stars. With no instruments other than a globe and a pair of compasses, he succeeded in detecting grave errors in the Alfonsine and Prutenic tables, and set about correcting them. In 1572 he discovered a new and brilliant star in the constellation Cassiopeia. After some time spent in travel, Brahe received from his sovereign, Frederick II, the offer of the island of Hven as the site for an observatory, the King also offering to defray the cost of erection and of the necessary astronomical instruments, as well as to provide him with a suitable salary. Brahe accepted the generous proposal, and in 1576 the foundation stone of the castle of Uraniborg ("fortress of the heavens") was laid. Here, for twenty years, Brahe pursued his observations.

After the death of his patron, Brahe's benefits were gradually withdrawn by Frederick's successor, Christian IV, and eventually the astronomer was deprived even of his observatory. In 1597, Brahe accepted an invitation of Emperor Rudolph II to come to Bohemia.

Rudolph gave him a pension of 3000 ducats and an estate at Benatky near Prague, where a new Uraniborg was to be built. It was not completed, however, before his death. In his latter years, Brahe had the services of Johannes Kepler as an assistant.

Brahe never fully accepted the Copernican system of the universe, and sought to compromise by combining it with the old Ptolemaic system. In the Tychonic system the five known planets were supposed to revolve around the sun, which, with the planets, circled the earth each year. The sphere of the stars revolved around the immobile earth once a day. Brahe may be said to have inaugurated the era of precision in astronomical measurement. Had it not been for the exactness of his observations, Kepler might have sought in vain for the three laws of planetary motion which are associated with his name. Among Brahe's works are *De Nova Stella* (1573), *Epistolæ Astronomicæ* (1596), and *Astronomiæ Instauratæ Mechanica* (1598).

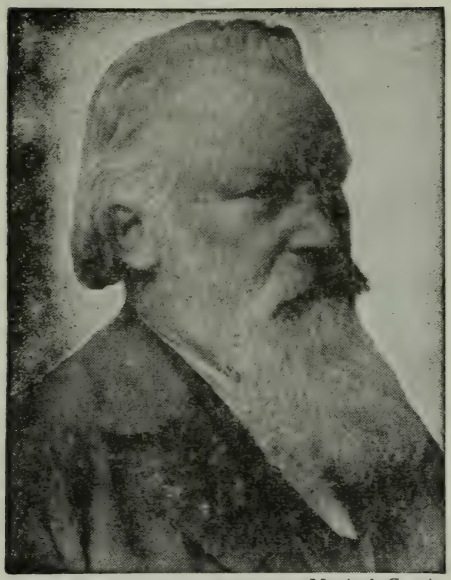
BRAHMA, in the Rig-Veda (see VEDA), the power of prayer; later in Hindu religion and philosophy, the supreme being or essence of the universe (that is, the ideal and supreme Brahma, who is uncreated, immaterial, and timeless). The personification of the supreme Brahma is Brahma the creator of the universe, who is also the first member of the Hindu Trinity (see also VISHNU and SIVA). As a formal triad this union is of later origin in the development of Hindu mythology. The attribute of creative activity is ascribed to various gods in the older Vedic period; but in the stage of the Brahmanas (a category of Vedic literature concerned with dogma and ritual, but containing also mythology and abstract speculations), the father god, Prajapati, or Brahma, appears as the individual creator. In the Hindu law book, *Manu,* Brahma is described as self-existent and as evolving the world from an egg—the doctrine of the cosmic egg—and his existence endures for an eon that is practically eternal. The representations of Brahma in Hindu mythology often show him as born in a lotus sprung from the navel of Vishnu. Five heads were originally assigned to him, but one was destroyed by Siva. His color is red, and he rides upon a swan. The goddess Sarasvati, or eloquence personified, is his consort; see VĀC. In the practice of the Hindu religion today Brahma plays almost no part. Vishnu and Siva have supplanted this too abstract god. But in the reform spiritual movement of the Brahmo Samaj (q.v.), God is worshiped under the form of the ideal and supreme Brahma, which comprises the three manifestations of Brahma, Vishnu, and Siva. See also HINDUISM.

BRAHMAN. See CATTLE.

BRAHMAN or **BRAHMIN,** the name of the sacerdotal, or highest, caste in the system of Hinduism (q.v.). The Brahman alone may interpret the sacred texts of Hinduism, the Vedas (q.v.). The primary duties of the Brahmans are the study and teaching of the Vedas, the performance of religious ceremonies for themselves and others, and the giving of spiritual guidance to the rest of mankind, which has to rely on them for the favor of the gods. The legendary account of Manu states that this caste issued from the mouth of the god Brahma at the moment of creation. To the orthodox Hindu, the person of a Brahman is sacred; Brahmans are the chief of all created beings, and other mortals enjoy life through them. The four stages in the ideal life of a Brahman are those of student, householder, anchorite, and religious mendicant. See CASTE.

BRAHMANISM, an aspect of Hinduism (q.v.), comprising the religious and philosophical doctrines and practices of the Brahman caste (q.v.). Brahmanism is based largely on the sacred texts known as the Vedas (q.v.), and also on the esoteric treatises called the Upanishads. As a refinement of the early merger of the Vedic religious concepts of the Aryan invaders of India with those of existing Dravidian cults, Brahmanism is characterized by pantheism, by the conception of final emancipation (e.g., reunion with Brahma and the achievement of blessedness by the extinction of desire), and by the caste system.

BRAHMAPUTRA (Skr., "son of Brahma"; anc. *Dyardanes* or *Oedanes*), one of the great rivers of India, rising as the Tsangpo or Matsang in s.w. Tibet. Its source, near the headwaters of the Sutlej and Ganges rivers, lies in the Kailas Range of the Himalaya, at an elevation of nearly 16,000 ft. The stream follows an easterly course for about 700 m. in Tibet, then swings southward, traverses the Himalaya, and enters the lowland plains of Assam, where it is called the Dihang. Shortly after leaving the mountains it receives from the east the Lohih or Brahmakunda, which was for a long time considered to be the main river. It combines with the Ganges to form the Ganges-Brahmaputra Delta 90 m. from the sea. Its total length is about 1800 m. The plains watered by the stream yield abundant crops of rice, jute, and mustard. The Brahmaputra is navigable by steamers as far as Dibrugarh in Assam, 800 miles from the sea.



Musical Courier

Johannes Brahms

BRAHMO SAMAJ (Skr. *samaja,* "assembly"), a Hindu religious sect founded in Calcutta, India, in 1828, by Raja Ram Mohan Roy, a Brahman. The members of the sect, the faith of which is based on the Vedas (see VEDA), believe in the worship of one God, and repudiate the use of graven or sculptured images and of sacrifices. Ram Mohan Roy was a social reformer as well as a religious leader and helped bring about the abolition of the barbarous practice of suttee (q.v.) in India. The next leader of the Brahmo Samaj was Babu Debendra Nath Tagore, a rich Brahman of Calcutta. He laid down the principles that the Vedas are not infallible, that true religious faith is based on intuition and nature, that moral righteousness is all-important, and that ceremonies, pilgrimages, and caste distinctions have no religious value. The third leader of the sect, Keshub Chunder Sen, who joined the church in 1857, emphasized the social reform activities of the movement. His action caused a split (1865) of the sect into two groups, the Adi ("original") Samaj and the Bharatvarshiya Brahmo Samaj, the latter under his leadership. The particular reform which Chunder Sen advocated was the abolition of child marriage; and when, in 1878, in spite of his teachings, he married off his 13-year-old daughter to a Hindu maharajah, a considerable number of his followers seceded, forming the Sadharan ("universal") Brahmo Samaj. Chunder Sen reorganized those left under his leadership into the Nava Bidhana ("new dispensation").

The Arya Samaj, a sect similar to the Brahmo Samaj, was founded in 1860 by the Brahman, Dayananda Sarasvati (1827–83). Its members base their faith on the Vedic hymns; believe in 3 eternal substances, God, spirit, and matter; advocate general education and reform of the caste system; and, like the Brahmo Samaj, oppose child marriage.

BRAHMS, JOHANNES (1833–97), German composer, born in Hamburg. He studied violin and cello with his father, and piano and composition with other teachers. He began his musical career as a pianist, and at the age of 20 became the accompanist of the noted violinist Eduard Reményi. Brahms made a number of tours in Europe as a piano virtuoso, and conducted choral societies and orchestras, including the Singakademie (1863–64) and the Gesellschaft der Musikfreunde (1871–74), both in Vienna. His early compositions impressed some of the foremost musicians and composers of the period. In 1853 Robert Schumann in a magazine article, *Neue Bahnen,* proclaimed that Brahms was destined to become the next great composer in the line of German composers that ran from Johann Sebastian Bach through Ludwig van Beethoven. The interest and encouragement Brahms received from Schumann and his wife, Clara, helped considerably in making this prediction come true. Combining the expression of the deepest and most varied emotions with the use of strict classic forms, the music of Brahms is the most important of the late Romantic period in Germany. Among his principal compositions are the orchestral works 2 *Serenades* (1860), *Variations on a Theme by Haydn* (1873), 4 *Symphonies* (1876–86), and *Tragic Overture* (1881); 2 *Concertos* for piano and orchestra (1854 and 1878–81), the *Concerto for Violin and Orchestra* (1879), and the *Double Concerto for Violin, Cello and Orchestra* (1888); chamber music, including 3 string quartets, 5 trios, and sonatas for piano and violin, cello, or clarinet; piano sonatas and piano music in smaller forms; many songs; and the choral works *German Requiem* (1868) and *Gesang der Parzen* (1883).

BRAHUI, the aboriginal population who preceded the Baluchis in Baluchistan, and are now the dominant people, chiefly in the region centering in Kalát, from Quetta on the north to Las Bela on the south. Both physically and linguistically they are said to be related to

the Dravidian tribes of India. The Brahui profess the Sunnite creed of Islam with native additions and modifications. Physically they are well built, thickset, short in stature as compared with the tall Baluchis, and have round faces, with brown hair and beards.

BRAIDWOOD, THOMAS (1715–1806), Scottish teacher of deaf-mutes. After graduating from Edinburgh University, he became a school teacher. He opened the first school for deaf-mutes in the British Empire, at Hackney, near London. He used the Heinicke system principally, "reading from the lip", giving prominence to attempts at articulation.

BRAILA, formerly IBRAILA, capital of the department of Muntenia (Walachia), Romania, on the Danube R., 102 miles N.E. of Bucharest. It is noted as a river port, and is the center of the grain export trade of the department. Industries in the city include the manufacture of flour, cement, soap, rope and twine, and sheet steel. In the vicinity of Braila, at Lacul Sarat ("Salt Lake"), are state-owned mineral springs, among the best-known in Europe. Pop. (1948) 95,514.

BRAILLE, LOUIS (1809–52), French teacher of the blind, born at Coupvray. He himself was blind from the age of 3, and in 1818 went as a foundling to the Institute for the Blind in Paris. He soon showed marked ability in both science and music, becoming famous in Paris as an organist and violoncellist. When 19 years old, he began teaching the blind in the Institute, and one year later conceived the idea of modifying the Barbier "point writing" method for the blind. This Braille system (q.v.), slightly modified, is today successfully used in many countries. See BLIND, AIDS FOR THE.

BRAILLE SYSTEM, a method of printing books for use by the blind, consisting of a system of raised points or dots, embossed in paper by hand or machine, and read by touch. Under this system each letter, numeral, or punctuation mark is indicated by the number and arrangement of one to six dots in a *cell,* or letter space, two dots wide and three dots high. The characters are embossed from the back of the paper, working in reverse direction, and are read from the face of the paper in normal reading direction. See BLIND, AIDS FOR THE; BRAILLE, LOUIS.

BRAILOWSKY, ALEXANDER (1896–), Russian pianist, born at Kiev. He was a student of the Polish master Theodor Leschetizky, in Vienna, and, after his debut in Paris, toured Europe, South America, and Australia. In 1924 he made his first American appearance, in New York City, and after 1926 made several tours of the United States. He was particularly noted as an interpreter of the music of Frédéric Chopin.

BRAIN, in anatomy, the principal controlling ganglion of the vertebrate central nervous system. It is located in the head, protected by the cranium, and is continuous with the spinal cord and the cranial nerves. Receiving nervous stimuli from the various external and internal sense organs, the brain co-ordinates them, and directs reaction. It is the organ of consciousness, memory, emotion, judgment, and imagination, and controls, directly or indirectly, all voluntary and involuntary activity of the body.

In man the brain comprises a larger part of the body weight than in any other animal except certain small birds, such as canaries and hummingbirds. About 15 percent of the body weight at birth, it averages 2.2 percent in the adult. In the average man the brain weighs about 3 pounds; in the average woman, about 4 ounces less. The popular supposition that a large brain indicates great intellect is true only in a general sense, and many notable exceptions to this rule have been observed.

The brain is made up of groups of highly differentiated nerve cells, interconnected by tracts of nerve fibers. Where the cells predominate, the brain tissue is gray; where the fibers predominate, their white sheaths give the tissue a white color. Developing from a straight tube in the embryo, the brain contains cavities, or ventricles, and canals, which are continuous with the spaces in and about the spinal cord. Based on both structure and function, the brain may be divided, from below upward, into the medulla oblongata, the pons and cerebellum, the midbrain, the thalamus, and the cerebrum.

The *medulla oblongata,* 2 to 3 inches long, is the upward continuation of the nerve tracts of the spinal cord. It contains the centers which control such automatic functions as respiration, heart action, and digestion, and the centers which regulate functions of the tongue, throat, and vocal cords.

The *cerebellum,* located above the medulla, expands to the back, forming about one seventh of the bulk of the brain. Its surface is covered with fine grooves, which give it the appearance of a tight skein of yarn. Nerve fibers from the cerebellum pass around and cross in front of the medullary nerve tracts forming the *pons,* or bridge, and connect with higher and lower centers of the brain

and spinal cord. The cerebellum controls muscular co-ordination and equilibrium.

The *midbrain* is a short section connecting the lower centers with the cerebrum. It contains cell groups controlling such automatic reactions of voluntary muscles as optic and auditory reflexes. Just forward of the midbrain, the *pituitary gland* is attached to the base of the brain by a thin stalk. By means of the internal secretions of this gland, many physiological functions of the body are regulated or controlled; see HORMONES.

One *thalamus* lies deep in each of the two cerebral hemispheres. The thalami control emotional responses and contain cell groups which relay sensation impulses to the cerebral cortex.

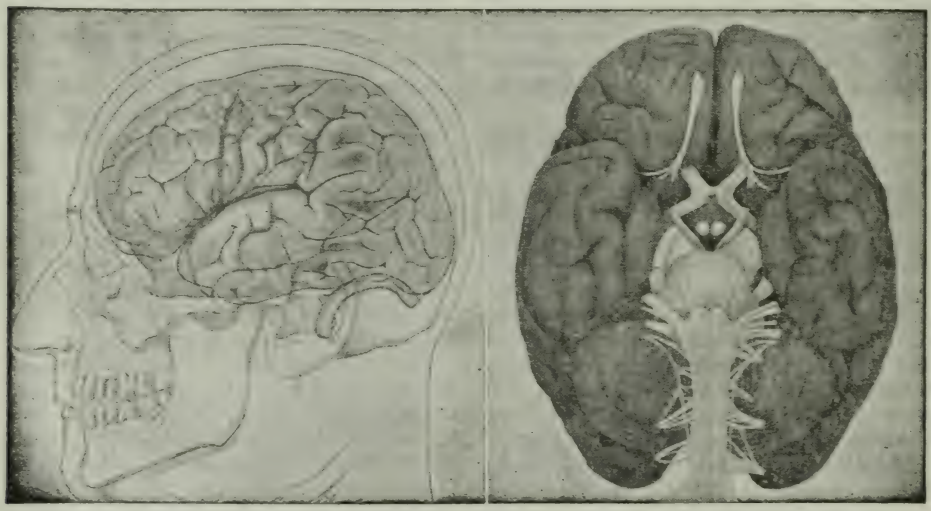
The *cerebrum,* forming the great bulk of the brain, is divided into two hemispheres by a deep longitudinal fissure. Each hemisphere is divided into frontal, parietal, occipital, and temporal lobes, and each lobe into convolutions or gyri. The folding of the surface produced by such fissures and convolutions greatly increases the surface area of the cerebral cortex, or outer layer of gray matter, and, consequently, the amount of functional brain tissue. Varying in thickness from 0.05 to 0.16 inch, the cortex covers the entire surface of the cerebrum, and contains the cell groups connected with the functions of sensation, memory, speech, and voluntary muscular control. White matter underlying the cortex contains tracts of nerve fibers connecting each group of cells with every part of the brain. Nerve cells of the cerebrum with their interconnecting fibers are connected with the functions of the consciousness, imagination, association, and judgment. Each hemisphere receives sense impulses from, and controls the action of, the opposite side of the body. Various types of nerve fibers cross at different levels in the brain and spinal cord; hence, by noting the combination of symptoms, the neurologist can determine the location of an injury or tumor in the central nervous system.

The *meninges,* or membranes covering the brain, are made up of three layers: the dura mater, tough and fibrous, follows the contour of the cranium; the pia mater, thin and soft, follows the contour of the brain, covering the convolutions and lining the fissures. Between the dura and pia, the arachnoid forms a fine, spongelike cushion. See NERVOUS SYSTEM.

BRAIN, DISEASES OF THE, general term for disorders caused by organic changes in the tissues of the brain or its membranes. Such changes are the result of infectious disease, injury, disturbance of the circulation, or the development of new growths.

Abscess of the brain is an acute, localized inflammation with destruction of brain tissue and production of pus.

Aphasia (q.v.), which is the inability to use or understand speech, and *amnesia* (q.v.), which is the total or partial loss of memory,



Left: Drawing of the human head, showing position of the brain in the skull.
Right: Drawing of the underside of the brain, showing cranial nerves and spinal cord.

may be caused by injury to the brain or by the degeneration of the association centers, as in arteriosclerosis. The terms are also applied to loss of memory caused by functional rather than organic disorders.

Brain fever and *inflammation of the brain* are terms commonly applied to meningitis (q.v.), although they are occasionally used for other disorders such as encephalitis (q.v.; see also SLEEPING SICKNESS) and the delirium which accompanies high fever.

Palsy or *paralysis* (q.v.) is a condition in which partial or complete loss of the use of a group of muscles, usually on one side of the body, is caused by injury to the motor centers or tracts on the opposite side of the brain. Such injury may be caused by mechanical violence, hemorrhage, or disease.

Softening of the brain is the common, and erroneous, term for any disease involving failure of mental power, especially for paresis, which in reality causes a hardening of the tissue. True softening is caused by embolism or thrombosis, in which the blood supply of a part of the brain is cut off by an obstruction in an artery; see ARTERIES, DISEASES OF.

Tumor of the brain is the development within the cranium of a growth which exerts pressure on part or all of the brain. Primary tumor of the brain is rare; of the total number of recorded cases glioma makes up almost one half, and tumors of the membranes and of the pituitary body, one quarter, with the remainder made up by infectious tumors caused by tuberculosis or syphilis, metastatic tumors arising from cancer in other parts of the body, and other less common forms. See NEOPLASM.

Anemia and hyperemia, which are conditions, rather than diseases, of the brain, are caused by defective circulation. Functional disorders of the brain include hysteria (q.v.), schizophrenia, and other types of psychoses; see PSYCHOLOGY, ABNORMAL. See also APOPLEXY; DELIRIUM; EPILEPSY; HALLUCINATION.

BRAINERD, county seat of Crow Wing Co., Minn., just E. of the Mississippi R. and about 130 miles N.W. of Minneapolis. It is the southern gateway to the Cayuna Mountain Range and its rich iron mines in the Crosby-Ironton district, 15 miles northeast. Farming and lumbering, as well as mining, are the important industries of the region surrounding the city. Brainerd has a large trade in grain, hay, lumber, and iron, and contains railroad shops of the Northern Pacific, foundries, bottling works, creameries, paper and pulp mills, lumber mills, and factories producing garments and wallpaper. Brainerd was settled in 1870 and chartered as a city in 1881. It is noted as a lake-resort center, and is the site of the annual midsummer Paul Bunyan Carnival and of an annual winter carnival. Pop. (1950) 12,637.

BRAINTREE, town in Norfolk Co., Mass., about 2 miles S. of Quincy. It forms in considerable part a residential suburb, but also contains oil refineries, and industrial establishments producing shoes, rubber goods, and abrasives. Braintree was settled in 1634 and was originally called Monoticut. Title to the land was cleared in 1665 by purchase from the Indian chief Wampatuck. Quincy was included in Braintree until 1792, and Randolph until 1793. In the portion of old Braintree now included within the limits of Quincy, Thomas Morton established his "New Canaan" at "Merrymount" (Mount Wollaston), and John Adams, John Hancock, and John Quincy Adams were born. Pop. (1950) 23,161.

BRAINWASHING. See PSYCHOLOGY, ABNORMAL: *Current Research.*

BRAKE or **BRACKEN,** common names for ferns of the genera *Pteris* and *Pteridium,* which are so closely related that many botanists consider them to be a single genus. They belong to the family Polypodiaceae, the true ferns, and are distinguished by having the same spore cases situated along the edges of the fronds (leaves) and covered by the reflexed margin of the frond.

The common brake, *P. aquilina,* is abundant in most parts of the world, growing in thickets, pastures, and open woodland. It has a long, creeping, black rhizome or rootstock, from which grow stalks from one to three feet in height. Each stalk divides into three branches, each branch into several fronds, and each frond into several pinnules, which, in the lower branches, are further subdivided. The rootstock, when cut across, exhibits an outline like a spread eagle, whence the specific name (Lat. *aquila,* "eagle").

The rootstock of brake is bitter and has been used as a substitute for hops; it has also been ground into a flour, used in times of famine for making a barely edible bread. Brake was at one time highly valued as an astringent and vermifuge. It is used as thatch, as litter for cattle, and occasionally as fodder. It is also used in dressing kid and chamois leather. The growing plant is a favorite year-round cover of deer and other game. It is killed to the ground by the first frosts, but remains

rigid and brown. Brake is occasionally used in large gardens as a background plant, and several species are grown as household plants.

BRAKES, a mechanical device, usually of a shoe or band applied to the surface of a rotating shaft or wheel in such a manner that motion is retarded by means of friction. The band is generally faced or lined with a heat-resisting material which will not readily wear away or become smooth and slippery. Leather was originally used for brake linings but it has been largely replaced by asbestos cloth.

A shoe brake consists of a wood or metal block or shoe which is pressed against the rim of a wheel by means of a system of levers. The hand brakes used on railway cars and the foot or hand brake used on horse-drawn vehicles are examples of shoe brakes. Band brakes consist of a flexible band looped around the perimeter of the wheel and contrived so that it may be tightened and thus grip the wheel. Such brakes are used on hoisting engines and motor vehicles, and also on some makes of bicycles. The internal expanding shoe brake, where by means of a toggle linkage or cam a hinged shoe is forced against the interior of a drum by simple lever action, is found on many automobiles.

The force required to press a brake shoe against a brake drum may be very great, especially for a heavy vehicle moving at high speeds. This force may be generated by hand, as in the "emergency brake" or parking brake of automobiles; usually, however, human force is boosted by such devices as the "air brake", "hydraulic brake", and "vacuum brake". The air brake was invented by Westinghouse in 1869, and revolutionized railway transportation by making rapid stops possible. In its original form, the shoe was pressed against the drum by air pressure to stop the train. A safer and more positive modification was soon introduced whereby the shoe and drum are kept apart by air pressure while the train is in motion. When the pressure is released, the brakes are applied. This method eliminates the danger of brake failure due to air leakage, for if the compressed air system should leak, the brakes would be automatically applied. Air brakes are used on all railroads and on some trucks, particularly trailer trucks.

Automobiles were originally equipped with "mechanical" (i.e., non-hydraulic) brakes, applied to the rear wheels only. For additional safety, four-wheel brakes were generally adopted during the 1920's. In mechanical brakes slight wear in one of the brake levers might cause swerving of a vehicle through uneven application of braking force. Hydraulic four-wheel brakes, which are now used on almost all automobiles and many trucks, are automatically self-aligning. When the operator presses the brake pedal, hydraulic fluid is sent from a single "master cylinder" to all of the brake shoes with the same pressure, and the same braking force is applied to each wheel.

BRAMANTE (1444–1514), Italian architect, whose real name was Donato d'Agnolo. He is sometimes known as Bramante Lazzari. Probably born at Monte Asdrualdo, near Urbino, he practiced painting under Piero della Francesca and Mantegna, and executed works in Milan and Bergamo (1472–77), but soon devoted himself entirely to architecture. His career falls into two main divisions: (1) The 28 years of early work in Milan, 1472–99; and (2) the 15 years of work in Rome, 1499–1514. Each period is marked by a style so distinct that some have questioned whether their works were really by the same master.

The most important of his Milanese works are the transept, apse, and sacristy of San Satiro (about 1480–88); his masterpiece in decoration and composition, the choir and dome of Santa Maria delle Grazie, with its perfect union of brickwork with details in terra cotta and marble; and parts of the Ospedale Maggiore. In the choir of Santa Maria delle Grazie he was the first to apply candelabrum shafts as an exterior decoration to pilasters, a device widely imitated in France and Spain after the battle of Pavia (1525).

Bramante was in 1503 entrusted with the planning of the greatest architectural labor of the Renaissance, the reconstruction of the Vatican Palace and of St. Peter's. His plans for St. Peter's, though only partly carried out, were known through drawings to all architects and exercised an enormous influence. They comprised a huge dome over the intersection of the arms of a Greek cross with apsidal terminations, and with towers, chapels, and loggias filling the four angles. He designed the two immense wings or galleries of the Vatican, to connect the older palace with a group nearly 1500 feet away to the north, but himself erected only the east gallery, with the northern block comprising the impressive *Nicchione,* or apse, and the Cortile di San Damaso at the southern end; this was later decorated by Raphael. His death in 1514 put both these undertakings into other hands.

BRAMBLE, any plant of the genus *Rubus,* which has an enormous number of species, including the raspberry, cloudberry, black-

berry, and dewberry (qq.v.). In England the term bramble is sometimes restricted to the native blackberry, *R. fruticosis*. In America the term bramble is sometimes extended to include any shrub which, like those of the genus *Rubus*, is thorny. See RUBUS.

BRANCHIA. See GILL.

BRANCHING, in botany, the production of subordinate stems from the main stem, or axis. When the growing point forks and produces two equally-growing stems, the branching is *dichotomous;* when the main axis continues in its original line of growth, giving off successive lateral axes, the branching is *monopodial*. Among the cryptogams (see CRYPTOGAMIA), dichotomy is more common, while the seed plants have a potential branch in every vegetative bud except the terminal bud which continues the main axis.

Monopodial branching is best exemplified in the conifers and poplars. False dichotomy is produced when the development of the terminal bud is arrested while the two adjacent lateral branches develop strongly, as in the lilac or the mistletoe. When the terminal and one lateral bud are arrested, the remaining lateral grows in the direction of the original axis, a series of such branchings may form a false axis called a *sympodium*, as in the linden. In some cases, such as the elm, oak, and apple, it is impossible to determine by external observation the course of the main axis, and the axis is said to be *deliquescent*, that is, dissolving among the branches. Leaves also frequently branch, and when the branches are distinct the leaves are said to be compound (see LEAF).

Arrangement of branching is one of the most characteristic and readily noted clues to the identification of plants; for example, the Rose and Legume families are characterized by alternate branching, while the Maple and Olive families are characterized by opposite branching. Some plants, such as the horehound, have *whorled* or *verticillate* branching, with several stems originating from the same point on the axis.

BRANCHIOPODA, a group of primitive crustaceans with *branchiae*, or gills, attached to the feet. The term has been used differently by various scientists. Originally a suborder of the obsolete order Entomostraca, Branchiopoda is now generally considered a subclass, containing several orders. The term Phyllopoda includes essentially the same animals. See PHYLLOPODA.

BRANCO, RIO, a river of Northern Brazil, which rises in the Parima Mountains, on the border of Venezuela, and after taking a southerly course of about 400 miles joins the Rio Negro, a tributary of the Amazon. For most of its length it is navigable by light-draught vessels.

BRANCUSI, CONSTANTIN (1876–1957), Romanian sculptor. He studied at the Bucharest Academy of Arts, at the École des Beaux-Arts, Paris, and under the celebrated French sculptor, François Auguste René Rodin. His early works, notably "The Kiss" and "The Sleeping Muse", which were completed between 1908 and 1911, are abstractions in a style obviously influenced by Rodin. After World War I, Brancusi was recognized in France as the leading figure among the moderns, and most of his work since 1915 has been characterized by balanced geometrical design, polished surfaces, and ovoid figures. Bronze is his favorite medium, but he has also created works in stone and wood. Brancusi's sculptures are among the collections of many American museums, including the Art Institute of Chicago, which has "The Sleeping Muse"; the Museum of Modern Art, New York City, which has "New Born" (1915) and "Bird in Space" (1919); and the Yale University Gallery, which has "Leda" (1920).

BRAND. See BRANDING; TRADE-MARK.

BRANDEIS, LOUIS DEMBITZ (1856–1941), American jurist and Associate Justice of the United States Supreme Court, born at Louisville, Ky., where he received his early education. After study at *Annen Realschule* in Dresden, Germany, he attended Harvard Law School, graduating in 1877. Brandeis achieved national prominence as a lawyer in many important cases, in which he invariably fought in the public interest. President Wilson appointed him an Associate Justice of the Supreme Court in 1916. On that bench he became noted for his liberal views, often joining with the late Justice Oliver Wendell Holmes in dissenting opinions critical of the predominant conservatism of his colleagues. Sixteen major New Deal laws (see UNITED STATES, *Roosevelt Administration*) came before the Court during his tenure; all but six of these received his approval. He was an active Zionist, and from 1914 to 1916 he served as chairman of the Zionist Provisional Emergency Committee. In Feb., 1939, he retired from the Supreme Court. His writings include *Other People's Money, and How the Bankers Use It* (1914); *Business—A Profession* (1914); and *The Curse of Bigness* (1934). Important collections of his writings are *The Social and*

Economic Views of Mr. Justice Brandeis (1930) and *The Brandeis Guide to the Modern World* (1941).

BRANDEIS UNIVERSITY, coeducational, non-sectarian, privately controlled institution of liberal arts, located in Waltham, Mass. It was founded in 1947 under Jewish auspices and named in honor of the American jurist Louis Dembitz Brandeis. Instruction was begun in 1948; the Graduate School of Arts and Sciences was established in 1953. Bachelor's and master's degrees are conferred.

The university library contains about 90,000 volumes, and there is an art and sculpture collection. More than 300 undergraduate scholarships are available in varying amounts, depending on ability and need. In addition, the university maintains a student-loan fund and offers a number of graduate fellowships. Enrollment in 1954–55 totaled 986, including 68 graduate students. The faculty numbered 101. The endowment (1954–55) was $1,176,000.

BRANDENBURG, former State of East Germany, bounded on the N. by Mecklenburg, on the E. by Poland, on the S. by Saxony and Saxony-Anhalt, and on the W. by Saxony-Anhalt and Lower Saxony. The terrain consists largely of a level plain, with extensive arable areas. There are many streams and canals, and more than six hundred lakes. The principal rivers are the Oder, with its numerous tributaries, the Elbe, the Spree, and the Havel. Natural resources include heavy stands of fir and pine and mineral deposits, mainly limestone, lignite, and gypsum. Agriculture is a leading industry; oats, barley, rye, potatoes, tobacco, flax, and hemp are the chief crops. Manufacturing industries include the production of textiles, paper, glass, tile, cigars and cigarettes, beet sugar, and machinery. Potsdam (q.v.) is the former capital.

The earliest known inhabitants of the Brandenburg region were the Suevi, a Germanic people. During the early Middle Ages a number of Slavic tribes occupied the region. The Slavs successfully resisted (8th century) attacks by the Frankish king Charlemagne, but were defeated (929) by the German king Henry I, who converted them to Christianity. Otto I, the son of Henry I, divided the territory into two marks (countships), which were later united as the mark of Brandenburg. The Slavs were not fully subjugated, however, until the reign (1150–70) of Margrave Albert I, the mark's first capable ruler. Albert extended Christianity and colonized Brandenburg with German settlers. Under his successors the area and influence of the mark increased, notably at the expense of Poland and Bohemia. From 1323 to 1411 the mark was ruled by princes of the houses of Wittelsbach and Luxembourg, and it declined steadily in wealth and power during this period. Holy Roman Emperor Charles IV recognized (1356) Brandenburg as one of the seven imperial electorates. In 1415 the electorate was placed under the rule of Frederick, Burgrave of Nuremberg and a prince of the House of Hohenzollern, by Holy Roman Emperor Sigismund. Frederick and his successors quelled the turbulent nobility, established a centralized government, and greatly extended the boundaries of the electorate. The Reformation was introduced about 1540, and the electors of Brandenburg subsequently became leading champions of the Protestant cause. The Confession of Brandenburg, a declaration of faith, was prepared by order of Elector John Sigismund in 1614 to reconcile the tenets of Lutheranism and Calvinism and to terminate disputes provoked by the Augsburg Confession (q.v.). In 1618 Elector John Sigismund became, through marriage, ruler of the duchy of Prussia.

Large sections of Brandenburg-Prussia were devastated during the first two decades of the Thirty Years' War (q.v.), but under the rule (1640–88) of Frederick William the nation emerged as one of the strongest powers of Europe. Frederick William was succeeded by his son Frederick III, whose dominions were proclaimed (1701) the Kingdom of Prussia by Holy Roman Emperor Leopold I. Frederick ascended the newly created throne as Frederick I. Brandenburg was then constituted a Prussian province; its history until the defeat of Germany in World War II is inseparable from Prussian history. Allocated to the Soviet Zone of Occupation in 1945, the province was established as a State of East Germany following the liquidation (1946) of Prussia. The State was dissolved and divided into districts (*Bezirke*) in 1952. Area of former State, 14,778 sq.m.; pop., (1946) 2,527,492.

BRANDENBURG or **BRANDENBURG AN DER HAVEL,** city of East Germany, situated on the Havel R., about 37 miles W.S.W. of Berlin. It is an industrial center, with shipyards and plants engaged in the manufacture of textiles, tin plate, bicycles, paper, hosiery, and beer. Brandenburg consists of three sections, known as the Old Town, the New Town, and the Cathedral Town. The Cathedral Town, on an island in the Havel, is the site of the cathedral, which dates from 1170, and a medieval castle. In the Old Town, situ-

ated on the right bank of the river opposite the New Town, is the town hall, a structure completed in the 14th century. Among other points of interest in Brandenburg are the encircling walls and the Katharinenkirche, a Gothic edifice built between the 14th and 16th centuries. Brandenburg was taken from the Slavs by Henry I, King of the Germans, in 927–28. In 948 it became the seat of a bishopric. During World War II, Russian forces occupied Brandenburg in May, 1945. Pop. (1946) 70,632.

BRANDES, Georg Morris (1842–1927), originally named Cohen, Danish critic and biographer, born in Copenhagen. He adopted a broad, cosmopolitan view of literary history previously unknown in Scandinavia. He traveled widely in Europe, returning, in 1871 to become docent at Copenhagen University, where he taught literature for five years, becoming professor in 1872. He was too radical and unconventional to suit the university authorities, however, and his notable series of lectures before large audiences occasioned bitter attacks by the orthodox clergy. He went to Berlin in 1877 and lived there for five years, writing and lecturing; and when he returned to Denmark a group of admirers guaranteed a stipend of $1000 yearly to him as a private professor. In recognition of his position in the critical world, the university left the chair of literature vacant. His fame grew among scholars at home and abroad; and when the Liberals gained power in 1892 the ministry gave Brandes a substantial pension, and in 1902 he was elected to the chair in the university that had remained vacant on his account thirty years. He lectured in England in 1913, and visited America in 1914.

Brandes has been called the greatest genius among Danish critics and one of the great systematic literary critics of modern times, the peer of the critics Saint-Beuve, Taine, and Brunetière. His literary output consisted of 33 volumes of history, biography, and criticism. Among them are *Aesthetic Studies* (1868), *Criticisms and Portraits* (1870), *Main Currents in Nineteenth-Century Literature* (6 vols., 1872–90), *Ferdinand Lassalle* (1877), *Sören Kierkegaard* (1877), *Lord Beaconsfield* (1879), *Danish Poets* (1884), a series of Shakespearean studies (1895–96), *Recollections of my Childhood and Youth* (1906), studies of Goethe (1915) and Voltaire (1916–17), and *The Jesus Myth* (1925).

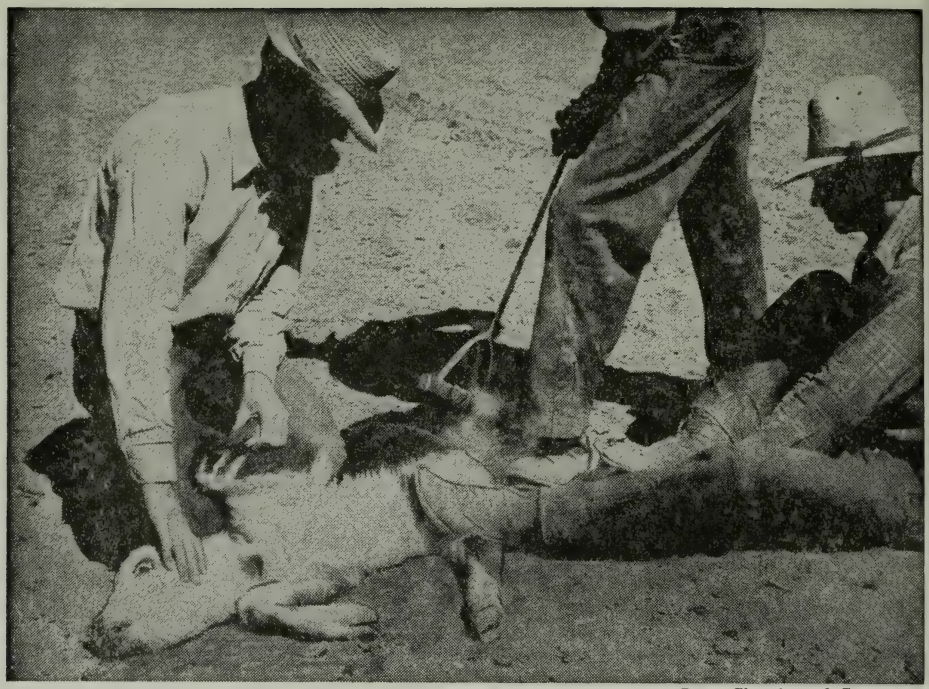
BRANDING, a word derived from the same root as *burn,* meaning, generally, a searing with hot iron. In the old days of the American cattle country, branding of animals was used by the various ranches as a means of identification, and still is, to a more limited extent. When the livestock of owners, who in many cases counted it by thousands, ran on unfenced government range, the brand was the only absolute proof of title; in most of the cattle States legal provision has been made for registration, and severe penalties provided for the altering of a brand. Calves are usually branded before they are weaned. The iron, heated a dull red, is applied long enough to sear the hide and prevent growth of hair. Cattle thieves "blotted" brands by clipping hair, using hot wire, and rebranding with a hot iron and a wet blanket.

In *criminal law,* branding was a form of punishment employed by the Greeks and Romans, and adopted by the Anglo-Saxons. In England laymen convicted of felony who claimed benefit of clergy, which exempted them from ordinary penalties, were branded by burning with a hot iron in the brawn of the left thumb. The brand, upon a subsequent conviction for felony, was evidence of the former conviction. By a statute of 1623, women convicted of simple larcenies under the value of 10 shillings were burned in the hand, whipped, stocked, or imprisoned, for a first offense, instead of being executed. By later legislation such offenders were branded on the cheek; but this was repealed seven years afterward. Early American colonists practiced branding to some extent.

BRANDON, the third-largest city in the province of Manitoba, Canada, 133 miles w. of Winnipeg, on the south bank of the Assiniboine River. It is an important railway center, served by the Canadian Pacific, Great Northern, and the Canadian National railways. It is the seat of Brandon College. Near the city are the Manitoba Experimental Farm and the Indian Industrial School. Brandon is the center of a rich agricultural region. It has grain elevators, creameries, flour mills, machine works, and an oil refinery, and manufactures threshing machines, bricks, cement blocks, pumps, windmills, and saddles. Pop. (1951) 20,598.

BRANDT, Sebastian. See Brant.

BRANDY, an alcoholic beverage produced by the distillation of grape wine and matured by aging in wooden casks. When freshly distilled the brandy is clear and colorless and will remain so if kept in glass containers. Placed in wooden casks, the spirit dissolves a coloring matter from the wood and acquires a light brownish tint, which dealers



Reno Chamber of Commerce

Branding a calf with a hot iron

often deepen by adding burnt sugar. The distinctive aroma of brandy is due to the presence of traces of higher alcohols, esters, and oenanthic ether. Alcoholic content, which is very high in the raw spirits and is reduced somewhat by aging, is adjusted usually to 40 to 45 percent by dilution with water when the brandy is bottled for sale.

The most famous brandy is that known as cognac, made from the grapes of the Cognac (q.v.) district in the southwest of France. Brandy is also made in other places, notably Spain, Portugal, and the United States. An inferior grade of brandy is made from the residue of grapes left in the wine press.

In the U.S., the term brandy is also applied to liquors such as apple brandy, pear brandy, and cherry brandy, made from fruits other than grapes. Fruit brandies are made by distilling the fermented fruit juice, or by adding the fruit flavor to grape brandy or commercial spirits. Sugar and an aromatic flavor are often added, but such a beverage is more properly called a cordial or liqueur (q.v.). See also DISTILLED LIQUORS.

BRANDY, formerly BRANDY STATION, a village in Culpeper Co., Va., about 55 miles s.w. of Washington, D.C., notable as a scene of fighting during the Civil War. Engagements occurred there on Aug. 20, 1862; on June 9, 1863, when the Confederate general Stuart, at the head of 10,000 cavalry, won a victory over Federal cavalry under generals Pleasanton and Buford; and on Sept. 13, 1863, and Oct. 11, 1863. Other skirmishes of minor importance were fought in this vicinity during the Chancellorsville and Gettysburg campaigns. The battle of June 9, 1863, is known also as the battle of Beverly's Ford. Pop. of the village (1950) 250.

BRANDYWINE, BATTLE OF THE, battle of the American Revolution, fought on Sept. 11, 1777, near Chad's Ford, Pa., about 25 miles s.w. of Philadelphia. British troops numbering about 18,000 men, under General William Howe, reached American positions along Brandywine Creek, a tributary of the Delaware River, in the course of a march on Philadelphia, then the American capital. In the ensuing action the British made a frontal feint at the American force, which totaled about 11,000 men under General George Washington, preliminary to a full-scale attack on its right wing. The American right, commanded by General John Sullivan, resisted stubbornly, but was forced to fall back,

and General Washington ordered a general withdrawal to Chester, Pa. Rear-guard units under General Nathanael Greene covered the retreat, successfully blocking British pursuit. Delayed by the American action, Howe was unable to reach Philadelphia until Sept. 27. British casualties totaled about 600; American losses numbered about 900 killed and wounded and 400 prisoners.

BRANGWYN, Sir Frank (1867–1956), British artist, born in Bruges, Belgium, of Welsh and English parents. He received his first education in art from his father, later studied with William Morris in England, and, through extensive travels in the East, came under the influence of Oriental art. Brangwyn's work in painting and in stained glass, tapestry, and pottery is characterized by unusually rich color and by expert design. Notable among his paintings are the murals "Modern Commerce" in the Royal Exchange, London; "King John Signing the Magna Carta" in the courthouse, Cleveland, Ohio; the mural decorations of the Missouri State Capitol; and his decorative panels in Rockefeller Center, New York City. His easel paintings include "Trade on the Beach" (Luxembourg Museum, Paris), "St. Simon Stylites" (Venice Municipal Museum), and "Sweetmeat Seller" (Carnegie Institute, Pittsburgh). Among his etchings are "London Bridge" and "The Paper Mill". Brangwyn was knighted in 1941.

BRANT, common name for any of several wild geese of the genus *Branta,* found on the coasts of Europe and North America during the winter and migrating to the extreme north portions of these continents to breed. The birds are generally brownish gray above, shading to a pale gray below; head and neck are black, with white bib. The common European brant is *B. bernicla,* the American brant is a variety, *hrota;* these geese reach a length of about 26 in., the smallest of the wild species. The Canada brant, *B. canadensis,* is better known as the Canada goose. The barnacle goose is a true brant. The pied, harlequin, or gray brant is a related species, *Anser albifrons,* more popularly called the white-fronted goose; the blue brant, *Chen caerulescens,* is the blue goose. See Goose.

BRANT, Joseph (1742–1807), the English name of Thayendanegea, a celebrated Mohawk Indian chief and friend of the British. When young he was sent to a school at Lebanon, Conn., by Sir William Johnson, who later married Brant's sister, Molly. Later Brant joined the Episcopal church, and for some time was a missionary among the Mohawk Indians, translating into their language the Prayer Book and parts of the New Testament. He aided the British in both the French and Indian and the Pontiac wars. In 1774 he became secretary to Guy Johnson, superintendent of Indian affairs, and throughout the Revolutionary War he served against the American colonists, leading numerous Indian raids. For the most part Brant treated captives with great humanity, opposing and whenever possible preventing torture. In 1786 he visited England, meeting many persons of prominence. With funds collected on this trip Brant built the first Episcopal church in Upper Canada.

BRANT or **BRANDT,** Sebastian (1458?–1521), German satirist and humanist, born in Strasbourg. He studied philosophy and jurisprudence at the University of Basel, taught and practiced law there, and returned to Strasbourg, where he became town clerk in 1501. Brant achieved fame through his satirical poem *Das Narrenschiff* ("The Ship of Fools"), published in 1494, one of the most remarkable and popular books of the time. Fifteen years after its appearance it was translated into English by Alexander Barclay (q.v.), as *The Shyp of Folys,* and again by Henry Watson, as *The Grete Shyppe of Fooles of the Worlde* (1517).

BRANTFORD, Canadian city, county seat of Brant Co., Ontario. It is 26 miles by rail s.w. of Hamilton, on the Grand River, and is served by the Canadian National and other railways. The city contains the Ontario School for the Blind and the Mohawk Institute for Indian Students. Brantford is located in a rich farming and fruit-growing region. It obtains electrical power from Niagara Falls. Its manufactures include agricultural implements; textiles; boilers, engines, and other railroad material; stoves; pots; and electric appliances. The city was named after Joseph Brant (q.v.), who settled here in 1784. In the vicinity of Brantford, Alexander Graham Bell, the inventor of the telephone, conducted his first successful experiment with that instrument. Pop. (1951) 36,727.

BRANTING, Karl Hjalmar (1860–1925), Swedish statesman, born at Stockholm. He founded the Swedish Socialist Party in 1889. By his oratorical ability and as a leader of a growing party he rose to the position of Minister of Finance in 1917–18; in 1920, 1922, 1924, and 1925 he was Prime Minister. In 1921 he shared the Nobel Peace Prize with

Christian Louis Lange, Secretary-General of the Inter-Parliamentary Bureau at Geneva.

BRANTÔME, PIERRE DE BOURDEILLES, SEIGNEUR DE (1540–1614), French biographer born in Périgord. In 1561 he accompanied Mary Stuart on her journey from France to Scotland, and in 1565 he joined the expedition sent to Malta to assist the Knights of St. John against the sultan. He also served in Italy, Africa, and Hungary under various leaders, and took part against the Huguenots in the religious wars. About 1594 he began to write his memoirs, and thenceforth lived in retirement until his death. His works include *Vies des Grands Capitaines Étrangers et Français, Vies des Dames Galantes,* and *Vies des Dames Illustres.*

BRAQUE, GEORGES (1881–), French painter, born in Argenteuil. During his early career, he was one of a group of painters known as the Fauves (see FAUVIST), who flourished in Paris from 1905 to about 1908; and from about 1908 to 1914 Braque, together with Pablo Picasso (q.v.), was a leading exponent of Cubism (q.v.). His works, for the most part still-life studies, with a few landscapes, are in the collections of many museums, including the Museum of Modern Art, Paris, and the Art Institute of Chicago. The Museum of Modern Art, New York City, has "Man with a Guitar" (1911), "Oval Still Life" (1914), "The Table" (1928), and five other paintings by him. In 1953 Braque completed three paintings on the ceiling of the Louvre in Paris.

BRASENOSE COLLEGE, a college of Oxford University (q.v.), England. Founded in 1509 by William Smith, Bishop of Lincoln, and Sir Richard Sutton, it is the last of the pre-Reformation colleges. Its name is derived from *Brassenhuss* ("brewhouse"), that of a building which originally occupied the site. Among its famous students were the author Richard Burton, the antiquarian Elias Ashmole, and the historian John Foxe.

BRASIDAS (d. 422 B.C.), the greatest Spartan general in the earlier years of the Peloponnesian War. In 431 B.C. he distinguished himself by the courage with which he relieved the town of Methone from a hostile attack. In 424 he relieved Megara, and he was no less successful through combined diplomacy and military skill in his expedition to Macedonia for the purpose of winning over the cities from their allegiance to Athens. His greatest acquisition was Amphipolis, where in 422, with a handful of helots and mercenaries, he defeated the Athenian army under Cleon. In the battle both generals were killed. Thucydides speaks of the eloquence of Brasidas, so unusual in a Spartan, as well as his justice, liberality, and wisdom; Plato compares him to Achilles.

BRAŞOV or **BRASHOV.** See STALIN (Romania).

BRASS, an alloy of copper and zinc. It is harder than copper, ductile, and capable of being hammered into thin leaves. Formerly any alloy of copper, especially one with tin, was called brass, and it is probable that the "brass" of the ancients was of this composition (see BRONZE). The modern alloy of copper and zinc came into use about the 16th century.

The malleability of brass varies with its composition, with the temperature, and with the presence, even in minute quantities, of foreign metals. Some kinds are malleable only while cold, others only while hot, and there are varieties not malleable at any temperature. All kinds become brittle if heated to near the melting point.

Brass has a greater tensile strength than any of the common metals except tungsten, steel, and nickel, and alloys of beryllium with copper or nickel. However, if it is subjected to continuous tension for a long time, it may undergo a molecular change with a resultant loss of strength.

It is prepared by mixing metallic zinc directly with copper in crucibles or in a reverberatory or cupola furnace (see FOUNDING). The ingots are rolled when cold. The bars or sheets can be rolled into rods or cut into strips and these drawn out into wire. In the drawing process the wire must be annealed at intervals. See ALLOY; METALLURGY; METALWORK; WIRE.

BRASSICA, a genus of herbs which, together with the genera *Raphanus* (radish) and *Diplotaxis* (crossweed), comprises a tribe, Brassiceae of the mustard family. The genus *Brassica* contains most of the plants commonly known as mustard, and all of the plants commercially raised for the purpose of producing mustard seed. It also includes the weed charlock, the forage and oil-producing plant rape, and several table vegetables: broccoli, Brussels sprouts, cabbage, cauliflower, collards, kale or borecole, kohlrabi, rutabaga, and turnip.

None of the plants of this genus is native to America, but many of them have been introduced from Europe and Asia, and some have become naturalized as wild plants. They are characterized by yellow flowers in racemes, leaves which are smooth or slightly lobed at

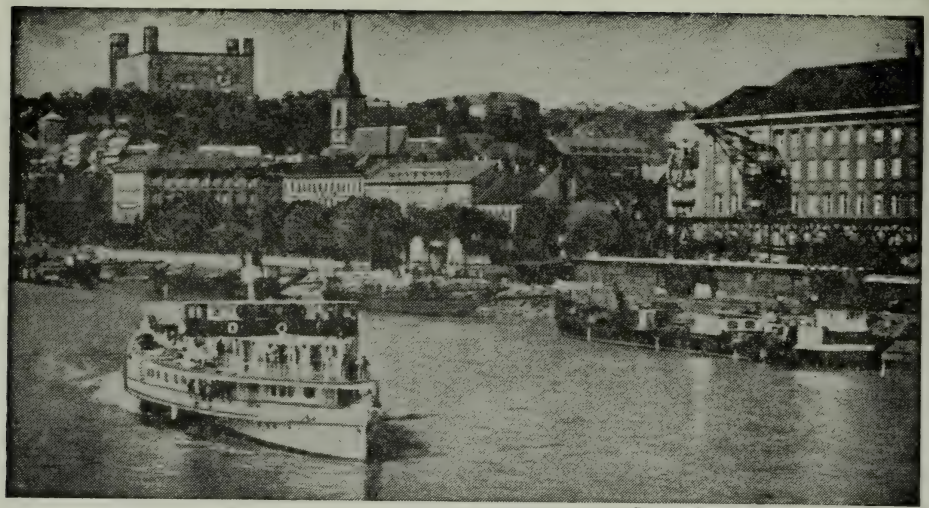
Hamilton Wright

Brass workers making decorative trays in a shop in modern Cairo, Egypt

the upper part of the plant but deeply lobed near the base, and spherical seeds which lie in a single row in the fruit. See CABBAGE; MUSTARD; RAPE; TURNIP.

BRĂTIANU, IOAN (1822–91), Romanian statesman, born in Pitesci, then a town in the Turkish principality of Wallachia. He participated in the Romanian uprising against Russian and Turkish rule in 1848, and served as prefect of police in the provisional government. After Russia and Turkey regained control of the country he was forced into exile. He returned to Romania in 1856, and later led the liberal opposition to the government of Prince Cuza, whom Turkey had recognized as the ruler of the united principalities of Wallachia and Moldavia. In 1866 he helped to secure Cuza's abdication and the election of Prince Charles of Hohenzollern as king. He held important ministerial posts in the new government during the next four years. Appointed to head a liberal cabinet in 1876, he led the united principalities into the Russo-Turkish War (1877–78) on the side of Russia. The Brătianu cabinet proclaimed Romanian independence from Turkey on May 21, 1877, and established the country as a kingdom four years later. Brătianu resigned as president of the cabinet in April, 1888. He was the author of several books, including *Mémoir sur l'Empire d'Autriche dans la Question d'Orient* (1855) and *La Question Religieuse en Roumanie* (1866).

BRĂTIANU, ION (1864–1927), Romanian statesman, son of Ioan Brătianu (q.v.), born at Florica, Romania. He was elected to the Romanian parliament in 1895 and given a ministry post in the Liberal cabinet of D. Sturza in 1896. From 1909 to 1911 he served as premier. Returned to the premiership in



Czechoslovak Information Service

View of the city of Bratislava from the Danube River

1913, he was head of the government when World War I began, and brought his country into the war on the side of the Allies. Following the defeat of the Romanian armies, he refused to accede to the peace terms imposed by the victorious Central Powers, and on January 29, 1918, he resigned. He formed a new government in December, 1918, and served until September, 1919, when he again resigned. As head of the Liberal Party, representing the wealthy, conservative interests in Romania, he led the opposition to the government until January, 1922, when he organized a new government. He initiated certain reforms, including universal suffrage and nationalization of the forests and mineral resources, but he ruled as virtual dictator of Romania until his death.

BRATISLAVA (Ger. *Pressburg;* Hung. *Pozsony*), capital of the Region of the same name, Czechoslovakia, situated on the Danube R., about 30 miles E. of Vienna. An important Danubian port and railway junction, it is the center of an extensive trade in grain, wine, and other agricultural commodities. The city is also a major industrial center, with diversified manufacturing enterprises, notably shipbuilding and the manufacture of furniture, chemicals, tobacco products, musical instruments, woolen goods, and leather products. Points of interest include the cathedral, an 11th-century Gothic edifice which was restored in the second half of the 19th century; the ruins of the former royal palace of Hungary, on a hill overlooking the city; a 13th-century Franciscan church; the town hall, another 13th-century edifice; and the University of Bratislava.

Founded prior to the 10th century, the city was known originally as Pressburg. Strong fortifications erected during the 12th century gave it great strategic importance; from 1541 to 1784 it was the capital of Hungary. In 1807, at the conclusion of the third phase of the Napoleonic Wars, Emperor Napoleon I of France met the Holy Roman emperor Francis II in the city and imposed the peace terms known as the Treaty of Pressburg. With the creation (1919) of Czechoslovakia after World War I, the city was renamed Bratislava and made capital of the province of Slovakia. Slovakia and the other provinces of Czechoslovakia were abolished in January, 1949, and at that time Bratislava became the capital of the newly created Region of the same name. Area of Region, 2904 sq.m.; pop. (1948) 838,134. Pop. of city (1947) 172,664.

BRATTLEBORO, town of Windham Co., Vt., on the Connecticut R., about 10 miles N. of the Massachusetts boundary. It is the commercial center of the surrounding farm region, and a noted resort for winter sports. In the town is one of the largest pipe organ factories in the world; other industrial products are cotton textiles, soft beverages, and granite memorials. Brattleboro was chartered in 1753 and derives its name from William Brattle of Massachusetts, one of the original grantees. Pop. (1950) 11,522.

BRATTON, HENRY DE. See BRACTON.

BRAUCHITSCH, Heinrich Alfred Hermann Walther von (1881–1948), German soldier, born in Berlin, and educated at a German military academy. He received a lieutenant's commission in 1900, served on the Imperial General Staff during World War I, and attained the rank of major general in 1931. After commanding in turn the 1st Army Corps and the 4th Army Group he was appointed (February, 1938) commander in chief of the German army. Von Brauchitsch directed the invasion of Poland, during the initial phase of World War II, and subsequent operations leading to the conquest of Norway, Denmark, the Low Countries, and France. On July 19, 1940, the German führer Adolf Hitler promoted him to the rank of field marshal. He supervised the armies which invaded (June, 1941) the U.S.S.R., but on Dec. 21, following the Soviet victories before Moscow, Hitler removed him as commander in chief. After the defeat of Germany he was arrested by the British on war-crimes charges. His death occurred shortly before he was scheduled to go on trial.

BRAUN, Karl Ferdinand (1850–1918), German physicist, born at Fulda. He received the degree of PH.D. from the University of Berlin in 1872. He held professorships at various German universities, and in 1895 became professor of physics and director of the Physical Institute at the University of Strasbourg. He is best known for his researches in radio; for those researches he was awarded the Nobel Prize in physics for 1909, which he shared with Marconi. In 1898 he patented a system of radio transmitters and receivers introducing the principle of resonance-coupled circuits. In 1902 he discovered a method of greatly increasing the energy of the transmitting station, and later he discovered a way of controlling the direction of effective radiation by suitable arrangement of the antennae. Among his other achievements were the accurate determination of the constant of universal gravitation in 1896, the invention of a cathode-ray oscillograph in 1897, the theoretical development of the electromagnetic theory of light, and the development of fine metallic gratings for optical purposes (see Diffraction).

BRAUNSCHWEIG. See Brunswick.

BRAUWER, Adriaen. See Brouwer.

BRAWNE, Fanny. See Keats.

BRAXTON, Carter (1736–97), American Revolutionary patriot and planter, born at Newington, Va. He spent some years in England, and on his return to America, in 1765, he supported Patrick Henry's Stamp Act resolutions. He was a member of the last House of Burgesses convened in Virginia by royal authority. In 1775 he was a member of Congress and signed the Declaration of Independence. He spent his fortune in equipping ships for the Revolutionary War.

BRAY, Thomas (1656–1730), English prelate and philanthropist, born at Marton, Shropshire. In 1698 he founded the Society for Promoting Christian Knowledge and in 1700 organized the Anglican church in Maryland. He obtained the passage by the Provincial Assembly of the Act of Religion, which in 1701 received royal sanction. A charter was acquired by him in 1701 for the Society for the Propagation of the Gospel in Foreign Parts, and in 1723 he founded for the continuance of his work the society known as the "Associates of Dr. Bray"

BRAZIL, officially The United States of Brazil, a federal republic of the South American continent, bounded on the N. by Venezuela, British Guiana, Surinam, French Guiana, and the Atlantic Ocean, on the E. by the Atlantic Ocean, on the S. by Uruguay, on the W. by Argentina, Paraguay, Bolivia, and Peru, and on the N.W. by Colombia. The republic has a common frontier with every country of South America except Chile and Ecuador. Occupying nearly one half of the entire area of South America, Brazil is the fifth-largest country in the world (after the Soviet Union, China, the United States, and Canada) The respective N. and S. limits of Brazil are delineated approximately by lat. 4°14′ N. and 33°46′ S.; the respective E. and W limits are delineated approximately by long 34°46′ W. and 74°03′ W. In a N. and S. direction, the maximum length is 2695 m.; its extreme width is about 2690 m. The area of the country is 3,286,169 sq.m.

The republic is composed of twenty States, five Territories, and a Federal District, which is coextensive with the city of Rio de Janeiro. The States are Alagoas, Amazonas, Baia, Ceará, Espírito Santo, Goiaz, Maranhão, Mato Grosso, Minas Gerais, Pará, Paraíba, Paraná, Pernambuco, Piauí, Rio de Janeiro, Rio Grande do Norte, Rio Grande do Sul, Santa Catarina, São Paulo, and Sergipe Acre, Amapá, Rio Branco, Guaporé, and Fernando de Noronha are the Territories Ownership of Serra dos Aimorés (3435 sq m.), a region in E. Brazil, is disputed between the States of Minas Gerais and Espírito Santo. The population of Brazil (1956 est.) is 59,996,000.

Rio de Janeiro (q.v.) is the capital and largest city. Other leading cities include São

Paulo, Santos, Recife, Salvador (formerly Bahia), Pôrto Alegre, Belém, Belo Horizonte, Fortaleza, Maceió, Niterói (Nictheroy), Curitiba, João Pessoa, Manáos, Maranhão (São Luiz), and Natal (qq.v.).

Physical Features. A vast region of highlands, known as the Brazilian Plateau, and the basin of the chief river system of South America are the dominant physiographic features of Brazil. The Brazilian Plateau is a deeply eroded tableland occupying most of the southeastern half of the country. With a general elevation of 1000 to 3000 ft., this tableland is irregularly ridged by mountain ranges and dissected by numerous river valleys. Its southeastern edge, generally parallel to the coast, rises abruptly from the ocean in various areas, particularly N. of lat. 10° S. and S. of 20° S. Among the principal ranges of the Brazilian Plateau are the Serra da Mantiqueira, the Serra do Mar, and the Serra Geral. Elevations in these and the other ranges average under 4000 ft., but several of the ranges are surmounted by lofty peaks. Mt. Itatiaia (9255 ft.), a summit in the Serra da Mantiqueira, is the highest known mountain in Brazil. Another noteworthy peak is Pedra Açu (7323 ft.) in the Serra do Mar. Much of the tableland terrain consists of rolling prairies (campos), and extensive tracts are forested.

The other major physiographic division, the basin of the Amazon R., comprises more than one third of the country's surface. Lowlands predominate in the Amazon basin; elevations rarely exceed 500 ft., and swamps and flood plains occupy tens of thousands of square miles of the region. Almost the entire basin is covered by tropical rain forest (selva). Because of the impenetrable character of this growth, huge areas of the Brazilian lowlands have never been explored. On the northern edge of the Amazon basin is another mountainous area, part of the uplift known as the Guiana Massif; ranges include the Tumuc-Humac Mountains, with elevations up to 3000 ft., the Serra Acarahy (maximum elevation, 2500 ft.), and the Serra Parima (maximum elevation, about 8000 ft.).

The Brazilian coast line, with a total length of about 5000 m., has singularly regular contours, particularly in the N., but several deep indentations provide excellent natural harbors. Especially noteworthy are the harbors of Rio de Janeiro, Salvador, and Recife. Excluding sections in which the Brazilian Plateau projects into the Atlantic Ocean, the coast is fringed by a coastal plain.

More than two thirds of Brazil is drained by the Amazon and Tocantins rivers, about a fourth by the Río de la Plata system, and the remainder by the São Francisco R. and smaller streams. The Amazon with its great branches, the Negro, Japurá, and Içá on the N., and the Javarí, Purús, Juruá, Madeira, Tapajoz, and Xingú on the S., and the Tocantins, which empties into the Amazon delta, afford a system of internal navigation comparable only to that of the Mississippi R. The length of the Amazon from the Peruvian boundary to its mouth is about 2500 m., almost all of which is navigable. The most important navigable streams in the plateau region are the São Francisco and Parnaíba rivers. The São Francisco is interrupted about 190 m. above its mouth by the falls of Paulo Afonso (275 ft.), but its upper course is navigable for more than 900 m. The Parnaíba, which, like most of the streams traversing the highlands, contains falls and rapids, is navigable for about 400 m., less than half its length. Rapids also severely impede navigation in the Uruguay R. One of the chief La Plata-system streams, it flows through Brazilian territory for over 600 m. and forms the Brazilian-Argentine frontier. The other great La Plata-system streams flowing through Brazil are the Paraguay and the Alto Paraná rivers, both important inland waterways. There are very few lakes in Brazil. Lagoa dos Patos, in the State of Rio Grande do Sul, is the country's largest lake. Actually a lagoon connected with the Atlantic Ocean, it is over 120 m. long and about 37 m. wide.

Climate. Climatic conditions in Brazil range from tropical to subtemperate. In the valley of the Amazon R. annual temperatures average between 80° F. and 90° F., with little diurnal or seasonal variation. Precipitation is heavy, averaging about 80 inches annually and amounting to more than 200 inches in certain areas. Maximum precipitation occurs between January and June. Tropical conditions prevail also over most of that portion of the coastal plain lying to the N. of the Tropic of Capricorn, but oceanic winds have a moderating effect on the high temperatures and humidity. The annual rainfall in this part of the coastal belt varies between 41 and 90 inches. In the coastal region S. of the Tropic of Capricorn climatic conditions are marked by sharp seasonal variations. Winter temperatures as low as 22° F. are occasionally recorded in the extreme S., and frosts are common throughout the region. Precipitation averages less than 40 inches annually in the

s. part of the coastal belt. In the E. central Brazilian uplands the climate is subtropical, but because of the higher altitudes there are sharp diurnal variations of temperature, and the nights are cool. This region is frequently subjected to severe droughts. In the highlands to the S. and W. precipitation ranges from adequate to abundant. Temperatures vary between subtropical and temperate in the S.E. highlands, which is the most densely populated section of the country.

Flora and Fauna. The flora of Brazil is highly diversified, particularly in the Amazon basin. Hundreds of species of plant life, including bignonias, laurels, myrtles, and mimosas, abound in this region. Palms and hardwoods are abundant, as are plants of the Euphobiaceae family (one of the chief sources of crude rubber). Mangroves, cacaos, dwarf palms, and brazilwoods thrive in the coastal region. Among the indigenous and widely cultivated fruits are the pineapple, fig, custard apple, mango, banana, guava, grape, and orange. Vegetation in the river valleys of the plateau region is luxuriant, but in the highlands the forests, consisting largely of deciduous species, are far less dense, and there are extensive tracts of bushes and open plains. Coniferous trees thrive in the areas where temperate climatic conditions prevail. In the arid sections of the plateau region cacti and other spiny plants are common.

The animal life of Brazil is also extremely varied and differs in many respects from that of North America and the Eastern Hemisphere. Larger animals include the puma, jaguar, ocelot, and several members of the dog family. Peccaries, tapirs, anteaters, sloths, opossums, and armadillos are abundant. Deer are plentiful in the south, and monkeys of many species abound in the selva. Many varieties of birds are indigenous to the country. The reptilian fauna includes several species of alligator and numerous species of snake, notably the bushmaster, fer-de-lance, and boa. Fish and turtles abound in the inland waters.

Production and Industry. Although the area under cultivation totals only about 46,436,000 acres, Brazil is primarily an agricultural country. Nearly one half of the world's coffee is grown on the plantations of São Paulo, Paraná, Espírito Santo, and Minas Gerais. The record yield for one year was 29,880,000 bags of about 132 lbs. each in 1933–34. Production in 1952–53 was 19,170,000 bags. Brazil also leads the world in the production of castor beans (about 150,000 tons annually) and ranks second in the production of cacao (about 125,111 tons in 1952). The cacao-growing industry was nationalized in 1943 but in 1952 reverted to private ownership. Orange growing is another enterprise in which Brazil holds second rank (after the United States); estimated production in 1952 was about 30,000,000 boxes of 70 pounds each. In 1952 the country ranked third in the production of refined sugar and second in the production of corn, with estimated yields of about 2,253,000 tons and 8,575,000 tons respectively. A large part of the sugar crop is sold on the domestic market or converted into anhydrous alcohol. In tobacco growing Brazil, with an output of more than 117,000 tons in 1952, ranks third in the world. Other major crops, with the approximate yield in 1952, are cotton, 384,422 tons; rice, 3,250,000 tons; dry, edible beans, 1,418,000 tons; and wheat, 586,000 tons (est.). Nearly 214,000 tons of bananas, another major crop, were exported in 1952. In 1952 the respective yields of tung and rubber were about 6766 and 32,952 tons. Other valuable products of Brazil's forests include carnauba wax, caroa fiber, medicinal leaves, vegetable oils, resins, nuts, and building and cabinet woods. Brazil has immense timber resources, its forest area covering an estimated 1,500,000 sq.m., but development of the lumbering industry has been limited by inadequate transportation facilities.

Livestock is raised in nearly all parts of the country, particularly in São Paulo and other southern States, where there are vast numbers of cattle, swine, sheep, goats, horses, asses, mules, and oxen. Beef cattle slaughtered in 1951 numbered over 6,400,000. Wool production in 1953 totaled about 26,000 tons. The fishing industry is owned by the government and is another important source of wealth. In 1950 the catch totaled about 168,650 tons.

Mineral resources are extensive, but scarcity of capital and inadequate transportation facilities have retarded development. Coal is mined in Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, and elsewhere. Production reached nearly 2,000,000 tons in 1952, and estimates put the national reserve at 5,000,000,000 tons. Gold is mined in Minas Gerais and other States; the output in 1952 was about 180,000 fine ounces. One of the richest iron-ore deposits in the world is located in Itabira, Minas Gerais, with known reserves amounting to more than 16,000,000,000 tons. Brazilian iron-ore output was about

3,276,000 tons in 1952. The country is the chief producer of quartz crystals and has vast deposits of monazite (principal source of thorium). In 1952 Brazil ranked first in exports of beryllium. Manganese and chrome ores, industrial diamonds, zirconium, and mica are produced in considerable quantities. There are valuable petroleum, bauxite, magnesite, graphite, titanium, copper, zinc, mercury, and platinum deposits, few of which are exploited.

Cotton weaving, the chief manufacturing industry, is centered in São Paulo, Minas Gerais, and Rio de Janeiro. In 1950 approximately 425 cotton factories produced about 1,200,000,000 square yards of cloth. The silk, woolen, and rayon industries are important and more than 20 paper mills are in operation. More than 15 jute mills process *caroa*, a native substitute for Indian jute, for the manufacture of cordage and coarse fabrics. The iron and steel industry, centered mainly in Rio de Janeiro, produced about 816,000 tons of pig iron and about 896,400 tons of steel in 1952. Flour and other foodstuffs, clothing, leather, rubber articles, chemical and pharmaceutical products, metallurgical products, aluminum, cement, glass, and porcelain are among other industrial products. São Paulo is the leading industrial State, with factories producing about one third of the country's total manufactures.

Commerce. In international commercial transactions during the postwar period, Brazil achieved moderately favorable trade balances. Brazilian foreign trade resulted in a serious deficit in 1951, however, and this trend continued in 1952. Exports in that year had an approximate value of 26,064,993,000 cruzeiros (one cruzeiro = $0.054); imports in the same year were valued at about 37,178,622,000 cruzeiros. The principal buyers of Brazilian products are the United States (over 50 percent by value of total exports), Argentina, France, and Germany. Leading exports are coffee, textiles, raw cotton, timber, crude rubber, rice, cacao, carnauba wax, castor beans, tobacco, processed meats, hides and skins, industrial diamonds, vegetable oils, and minerals.

The United States replaced Germany as the main source of Brazilian imports at the start of World War II, and continued to maintain that position after the war, with Germany ranking second, and Great Britain third in 1952. The chief imports are machinery, electrical equipment, hardware, chemical and pharmaceutical products, automobiles and automobile parts, gasoline and Diesel oil, coal and wheat.

Communications. The railroad system of Brazil consists (1951) of nearly 23,000 m. of lines, chiefly S. of Baía, operating over tracks of several different gauges; only a small part of the total is electrified. The chief railroad is the government-owned Central Brazil (over 2000 m.), which links with the railroad systems of Uruguay, Argentina, and Paraguay, and is partly electrified. Roads and highways cover about 170,000 m., concentrated mainly in the S. and N.E. sections of the country. A national highway system of 24,000 m., connecting all parts of the country, is being developed. Inland waterways, totaling nearly 22,000 m. and consisting chiefly of the Amazon and its affluents, connect Brazil with other South American countries and provide important means of transportation within the country. Within the Amazon basin, waterways are the only means of transportation. Forty-five harbors along the Brazilian coast line serve coastal and international commerce. About 36,000 ships, with a registered tonnage of approximately 50,000,000, enter Brazilian ports annually. The principal ports are Rio de Janeiro and Santos, which is a free port for Bolivia and Paraguay. The Brazilian merchant fleet in 1952 included 384 vessels of 100 tons or more; the country's largest steamship line is government-owned. There is an extensive network of domestic air lines, and several international air-transport systems link Rio de Janeiro with major world points. Brazil has a federal postal service, with about 4500 post offices, and telephone and telegraph systems. Radiobroadcasting stations numbered 300 in 1950; and there were 3 television stations in 1953.

People, Language, and Religion. Approximately 61 percent of the population of Brazil is composed of people of European origin (chiefly Italian, Portuguese, Spanish, German, and Russian). Mulattoes and mestizos are the second-largest grouping, comprising 26.5 percent of the population. The mestizos, sometimes called *caboclos*, are a mixture of European and aboriginal stocks. Negroes (about 11 percent), full-blooded aborigines, dwelling principally in the Amazon basin (less than 2 percent), and Asiatics, mainly Japanese (about 0.5 percent), comprise the other important groupings. Foreign-born aliens number slightly more than 1,000,000. In descending order of size, the principal foreign-born groups are Portuguese, Italian, Spanish, Japanese, German, and Syrian. Un-

der Brazilian law the number of immigrants admitted annually from any country is restricted to 2 percent of the total admitted from that country during the preceding fifty-year period. The quota is raised, however, if 80 percent of the immigrants are farmers or agricultural technicians.

Portuguese is the official language of Brazil, but German and Italian are spoken by many of the people, especially in the s. part of the country. About 93 percent of the population is Roman Catholic. The government maintains a representative at the Vatican, but the Roman Catholic Church and the state are formally separated. Roman Catholic sees in Brazil include 65 dioceses and 17 archdioceses.

Education. Brazil has a free public-school system, and attendance is compulsory. In 1951 approximately 5,350,000 pupils were enrolled in 82,678 primary schools, most of which are maintained by the States and municipalities. Secondary schools in 1950 totaled over 5600, with more than 625,000 enrolled pupils. The institutions of higher learning include eight public universities, namely the University of Brazil, founded in Rio de Janeiro in 1920; the University of Recife (1946); the University of Baía (1946); the University of Paraná (1946); the Rural University in the State of Rio de Janeiro (1948); and the universities of Minas Gerais (1927), São Paulo (1934), and Rio Grande do Sul (1934). A total of 211 institutions of higher learning included in 1948 three denominational (Roman Catholic) universities, fifteen schools of medicine, thirty-nine schools of pharmacy and dentistry, twenty-five schools of law and social sciences, and fifteen engineering and mining schools. Approximately 50 percent of the adult population is illiterate.

Government. Brazil is governed according to the provisions of the constitution of 1946. By the terms of this document, which supplanted that of 1937, executive authority is vested in a president and vice-president, who are elected for five-year terms and may not succeed themselves. Legislative power is vested in a national legislature consisting of a Senate and a Chamber of Deputies. Members of the Chamber are elected for four-year terms, and members of the Senate for eight-year terms. Voting is by secret ballot and is compulsory for literate, civilian males between the ages of eighteen and sixty-five and for employed females in that age group. Voting is optional for persons over sixty-five, unemployed women, and officers in the national armed forces. Illiterates and enlisted men in the armed forces are denied the franchise.

Under the constitution the government has wide latitude in making social and economic changes which "conform to the principles of social justice, conciliating free enterprise with appreciation for the value of human labor". The constitution of 1946 provides also that the government may, in the public interest, take over private industry, and, in the field of politics, may ban any party with a program considered antidemocratic. Freedom of speech and of the press have only limited guarantees; such activities as propagandizing for war, disseminating race or class prejudices, and teaching subversive doctrines are prohibited. Among unusual features of the constitution are a provision exempting professors and journalists from the payment of income taxes, another which exempts authors from the payment of taxes on their royalties, and one that guarantees tenure after ten years of continuous employment.

The twenty Brazilian States have their own popularly elected legislatures and governors, and their own constitutions, and enjoy considerable autonomy.

History. The Spanish navigator Vicente Yáñez Pinzón was the first known European to set foot on any portion of the region comprising what is now Brazil. Landing near the site of present-day Recife on Jan. 26, 1500, he subsequently coasted northward as far as the mouth of the Orinoco R. The newly found territory fell within the region assigned to Portugal by the terms of the Treaty of Tordesillas (1494), a Spanish-Portuguese agreement that modified the Line of Demarcation promulgated in 1493 by Pope Alexander VI (see DEMARCATION, LINE OF; AMERICA, SOUTH: *History*). Probably for this reason, Spain made no territorial claims on the basis of Pinzón's discovery. In April, 1500, the Portuguese navigator Pedro Álvares Cabral also reached the coast of present-day Brazil and formally claimed the surrounding region in the name of Portugal. The territory was named *Terra da Vera Cruz* ("Island of the True Cross"). An expedition under the command of the Italian navigator Amerigo Vespucci was sent to Terra da Vera Cruz by the Portuguese government in 1501. In the course of his explorations Vespucci named many capes and bays, including a bay which he called Rio de Janeiro. He returned to Portugal with a cargo of brazilwood, and

Terra da Vera Cruz was then renamed Brazil, after the valuable timber.

Additional expeditions were dispatched to South America during the next thirty years, but the Portuguese crown, concerned mainly with the consolidation of its Asiatic empire, made no attempt to establish enduring settlements in Brazil. Portugal's apathy toward its New World possession encouraged several powers, notably France, to become active in the region. These incursions were finally challenged by the Portuguese king John III, who initiated (1530) a program of systematic Brazilian colonization. As a first step the king divided Brazil into fifteen districts (called captaincies) and granted each of the districts, in perpetuity, to a person prominent at the Portuguese court. The grantees, known as *donatarios,* were vested with extraordinary powers over their domains.

In January, 1532, Admiral Martim Affonso de Sousa, one of the *donatarios,* founded a settlement (São Vicente) on the coast of present-day São Paulo. It gradually developed into a flourishing captaincy. In 1534–35 the Portuguese soldier Duarte Coelho Pereira (1485?–1554), another *donatario,* founded in N.E. Brazil the town and captaincy of Pernambuco, which also became a flourishing colony. Eight additional captaincies were colonized, but their development was seriously impeded in consequence of attacks by the aborigines, French raids, and the incompetence of the *donatarios.*

Because of the dangers implicit in the French depredations along the Brazilian coast, King John revoked most of the powers held by the *donatarios* and placed Brazil under the rule of a governor general. The first governor general, Thomé de Souza, arrived in Brazil in 1549, organized a central government, with the newly founded city of Bahia (now Salvador) as his capital, instituted comprehensive administrative and judicial reforms, and established a coast-defense system. Large numbers of Negro slaves were brought into the region to overcome the shortage of laborers.

In 1555 the French founded a colony on the shores of Rio de Janeiro Bay. The Brazilians destroyed the French colony in 1560, and in 1567 they established on its site the city of Rio de Janeiro. Philip II of Spain inherited the Portuguese crown in 1580. The period of Spanish rule was marked by frequent aggressions against Brazil by the English and Dutch, Spain's traditional enemies. A Dutch fleet seized Bahia in 1624, but the city was recaptured by a combined force of Spanish, Portuguese, and Indians in the following year. In the next Dutch attack (1630), an expedition sponsored by the Dutch West India Company captured Pernambuco (now Recife) and Olinda. Most of the territory between Maranhão Island and the lower course of the São Francisco R. fell to the Dutch in subsequent operations. Under the able governorship of Count Joan Mauritz van Nassau-Siegen, the Dutch-occupied part of Brazil prospered for several years. Nassau-Siegen resigned in 1644, however, in protest against the Dutch West India Company's exploitative policies. Shortly after his departure the Portuguese colonists, with support from their mother country, rose in rebellion against Dutch rule. The Dutch capitulated in 1654, after nearly a decade of struggle, and in 1661 renounced by treaty their claims to Brazilian territory.

With the successful revolt (1640) in Portugal against Spanish overlordship, Brazil had reverted meanwhile to Portuguese sovereignty and had been made a viceroyalty. Generally peaceful conditions prevailed between the Spanish and Portuguese in South America until 1680. In that year the Portuguese dispatched an expedition southward to the E. bank of the estuary of the Río de la Plata and founded a settlement called Colonia. This move led to a protracted period of strife over ownership of the region, which eventually emerged (1828) as the republic of Uruguay (q.v.).

Brazilian expansion southward had been preceded by penetration of large sections of the interior. Jesuit missionaries had begun to operate in the valley of the Amazon R. early in the 17th century. Before the middle of the century parties of Paulistas, as the people of the original Portuguese colony in Brazil were known, had reached the upper course of the Paraná R. Because these expeditions were undertaken primarily for the purpose of enslaving the Indians, the Paulistas met vigorous opposition from the Jesuits. Supported by the crown in their efforts to protect the Indians, the Jesuits finally triumphed. Many of the Paulistas thereupon became prospectors, and a feverish hunt for mineral wealth ensued. In 1693 rich gold deposits were discovered in the region occupied by present-day Minas Gerais. The resultant gold rush brought tens of thousands of Portuguese colonists to Brazil. The economic expansion of the viceroyalty was further stimulated by the discovery (1721) of diamonds and by the

development of the coffee- and sugar-growing industries.

During the War of the Spanish Succession, the French, retaliating against Portugal because of its alliance with Great Britain, made systematic raids on Brazilian coastal towns. The French captured and sacked Rio de Janeiro in 1711, but withdrew after exacting a large ransom.

Events of great importance in Brazilian history transpired during the second half of the 18th century. In 1750, during the first year of the reign of King Joseph Emanuel of Portugal, an agreement (known as the Treaty of Madrid) between Spain and Portugal confirmed Brazilian claims to a vast region w. of the limits promulgated in the Treaty of Tordesillas. The Treaty of Madrid was later annulled, but its principles were embodied (1777) in the Treaty of Ildefonso.

The Portuguese foreign minister and premier Marquês de Pombal instituted many reforms in Brazil during the reign of King Joseph Emanuel. He freed the Indian slaves, encouraged immigration, reduced taxes, eased the royal monopoly in Brazilian foreign commerce, centralized the governmental apparatus, and transferred (1763) the seat of government from Bahia to Rio de Janeiro. Pombal also expelled (1760) the Jesuits, whose influence among the Indians and growing economic power were resented by many Brazilians.

The Napoleonic Wars profoundly altered the course of Brazilian history. Early in November, 1807, the French emperor Napoleon I dispatched an army across the Spanish frontier into Portugal. The Portuguese regent Prince John and most of his court embarked on a royal fleet at Lisbon shortly before the arrival of the French army and sailed for Brazil. Prince John made Rio de Janeiro the seat of the royal government of Portugal and decreed a series of reforms and improvements for Brazil, particularly removal of restrictions on commerce, institution of measures beneficial to agriculture and industry, and creation of schools of higher learning.

Prince John inherited the Portuguese crown as John VI in March, 1816. In the five-year period before his recall to Portugal, his regime steadily lost favor among the Brazilians. The royal government was corrupt and inefficient, and republican sentiment, widespread in the country following the French Revolution, had gained considerable momentum after the revolutionary outbursts in Spanish America. In 1816 King John intervened in and occupied Banda Oriental (Uruguay), then under the control of Spanish-American

O.I.A.A Photo

Buildings in downtown São Paulo, center of the cotton-weaving industry of Brazil

revolutionaries. He crushed a revolutionary uprising in Pernambuco the next year. Banda Oriental was annexed to Brazil in 1821, and renamed Cisplatine Province.

Before departing (April, 1821), for Portugal, John VI made his son Dom Pedro IV regent of Brazil. Sharp antagonism to the king's Brazilian reforms had developed meanwhile in Portugal; the Cortes, the Portuguese legislature, enacted legislation designed to return Brazil to its former status as a colony. Dom Pedro was ordered to return to Europe. Responding to the pleas of the indignant Brazilians, Dom Pedro announced (January, 1822) his refusal to leave Brazil. He convoked a constituent assembly on June 3, and on Sept. 7, when dispatches from Portugal disclosed that the Cortes would make no major concessions to Brazilian nationalism, he proclaimed the country's independence. By vote (Oct. 12) of the upper house of the constituent assembly he became emperor of Brazil (crowned as Pedro I on Dec. 1). All Portuguese troops in Brazil had been forced to surrender by the end of 1823.

An autocratic ruler, Pedro I lost much of his popular support during the first year of his reign. Because of dissension within the constituent assembly, he dissolved (1823) it and promulgated a constitution in March, 1824. In 1825 Brazil, provoked by Argentina's support of a rebellion in Cisplatine Province, became embroiled in war with that country. The Brazilians were decisively defeated (1827), and through British mediation Cisplatine Province won independence as Uruguay. Popular opposition to Pedro I mounted during the next few years. On April 7, 1831, he abdicated in favor of Dom Pedro II, the five-year old heir apparent.

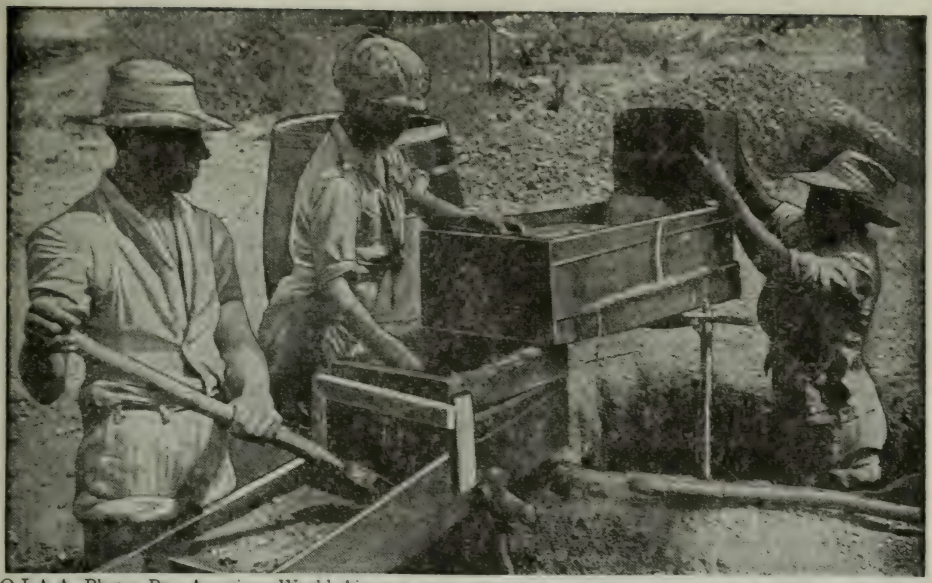
Regencies ruled Brazil for the following decade, a period of political turbulence marked by frequent provincial revolts and uprisings. Toward the end of the decade a movement to place the young emperor at the head of the government gained popular support, and on July 23, 1840, the Brazilian parliament proclaimed that Pedro II had attained his majority.

Pedro II proved to be one of the most able monarchs of his time. During his reign, which lasted nearly half a century, the population and economy expanded at unprecedented rates. National production increased by more than 900 percent. A network of railways was constructed. In the realm of foreign affairs the imperial government was actively hostile to neighboring dictatorial regimes. Brazil supported (1851–52) the successful revolutionary war against the Argentine dictator Juan Manuel de Rosas. Allied with Argentina and Uruguay, Brazil fought a victorious and sanguinary war (1865–70) against Paraguay, then a dictatorship under Francisco Solano López (1827–70).

The chief domestic political issue of the emperor's reign grew out of a broad movement for the abolition of slavery in Brazil. Importation of Negro slaves was outlawed in 1853. An organized campaign for emancipation of the 2,500,000 slaves already in Brazil was launched a few years later. The abolitionists won their first victory when, in 1871, the national parliament approved legislation freeing children born of slave mothers. For various reasons, including the sacrifices entailed by the Paraguayan war, a parallel movement for a republic developed at about this time. Liberalism became widespread during the next fifteen years. Slaves over sixty years of age were liberated in 1885. Three years later (May, 1888) all remaining slaves were emancipated.

Instituted without compensation for the slaveowners, emancipation alienated the powerful landed interests from the government. Moreover, sections of the Roman Catholic clergy were hostile to certain of Pedro's policies, many leading army officers were secretly disloyal, and large sections of the populace favored a republic. On Nov. 15, 1889, a military revolt under the leadership of General Manuel Deodoro da Fonseca forced the abdication of Pedro II. A republic was proclaimed, with Fonseca as head of the provisional government. Separation of church and state and other republican reforms were swiftly decreed. The drafting of a constitution was completed in June, 1890. Similar in many respects to the Constitution of the United States, it was adopted on Feb. 24, 1891, and Brazil became a federal republic, officially styled the United States of Brazil. Fonseca was elected its first president.

Political turbulence, due essentially to the lack of national democratic traditions and experience, marked the early years of the new republic. During 1891 President Fonseca's arbitrary policies and methods aroused strong congressional opposition; early in November he dissolved the congress and assumed dictatorial power. A naval revolt later that month forced him to resign in favor of Vice-President Floriano Peixoto. The Peixoto government, another dictatorial regime, survived a sanguinary naval rebellion (1893–94) and



O.I.A.A. Photo: Pan American World Airways

BRAZIL'S MINING AND RUBBER INDUSTRIES

Above: Separating monazite from the soil by the simple method of washing the soil to lower levels, the heavier ore remaining in the upper boxes.

Right: Preparing rubber for shipping. The milky juice of the rubber tree is congealed by alternate pouring on a stick and smoking until a large enough ball is obtained.

a series of uprisings in southern Brazil. Order was gradually restored in the country during the administration (1894–98) of President Prudente José de Moraes Barros, the nation's first civilian chief executive. A protracted revolt in the State of Baía was finally crushed in 1897. Beginning in 1898, when Manuel Ferraz de Campos Salles, a former governor of São Paulo, became president, energetic measures to rehabilitate the dislocated national economy were adopted. By securing a large foreign loan Campos Salles strengthened Brazilian credit and finances and expanded the nation's trade and industry. A serious boundary dispute with French Guiana was settled (1900) by Campos Salles, and during the administration of his successor Francisco de Paula Rodrigues Alves frontier controversies with Bolivia, Venezuela, British Guiana, and Dutch Guiana were settled. Coffee and rubber production had meanwhile increased steadily in Brazil. Between 1906 and 1910 falling coffee prices on the world market severely disrupted the national economy. The price of Brazilian rubber began to drop toward the close of this period. As a result social and political unrest was widespread during the administration (1910–14) of President Hermes de Fonseca, a conservative and militarist. Wenceslau Braz Pereira Gomes, an industrialist, was elected to the presidency without opposition in 1914.

After the outbreak of World War I rising demands in foreign markets for Brazilian coffee, rubber, and sugar considerably relieved the country's economic difficulties. Brazil adopted a policy of neutrality in the early stages of the war, but in consequence of

German attacks on Brazilian shipping severed diplomatic relations with Germany on Aug. 11, 1917. On Oct. 26, 1917, Brazil entered the war on the side of the Allies. Brazilian naval units were dispatched to the fighting zones, and the nation's contributions of food and raw materials to the war effort were substantial. The country was represented at the Paris Peace Conference, which drafted the treaties ending the war, and became (1920) a founding member of the League of Nations. A few years later Brazil failed to win election to the permanent council of the League and, in protest, withdrew from the organization.

Industrial retrenchment and sharp curtailment of governmental expenditures were necessitated by the onset (1922) of an economic crisis. The succeeding period of unrest culminated (July, 1924) in large-scale revolt, especially serious in São Paulo. Most of the army remained loyal to President Arthur da Silva Bernardes, who had taken office in 1922, and after more than six months of fighting the rebels were defeated. Bernardes ruled by martial law for the remainder of his term. During the administration (1926–30) of his successor President Washington Luiz Pereira de Souza, the economic crisis deepened, engendering numerous strikes and an upsurge of radicalism. Strikes were outlawed by the government in August, 1927, and stringent measures against communism were adopted.

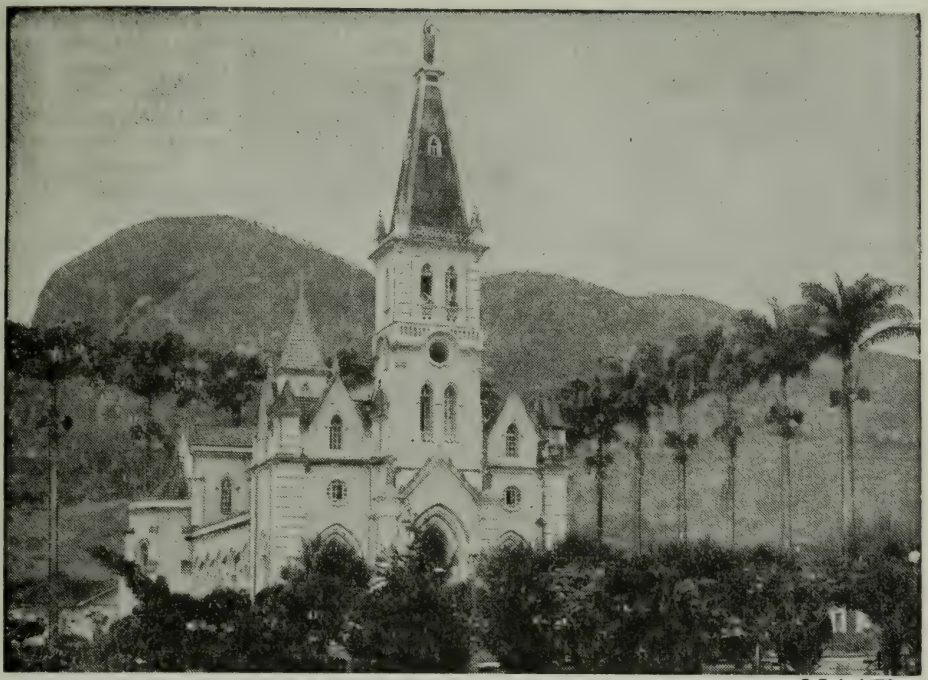
In the presidential contest of March, 1930 the administration-sponsored candidate Julio Prestes was declared the victor over Getulio Dornelles Vargas, a prominent politician and nationalist of the State of Rio Grande do Sul. Vargas gained the support of many military and political leaders and, on Oct. 4, led a revolt against the government. After about three weeks of bitter fighting President Luiz Pereira de Souza resigned and Vargas assumed absolute power as provisional president.

In an attempt to ease the country's economic distress Vargas reduced coffee production and purchased and destroyed surplus stocks of the commodity, but expenditures entailed by this program intensified the financial problems of the government, and Brazil defaulted on its foreign debt. In 1932 the Vargas regime quelled a formidable rebellion in São Paulo after nearly three months of large-scale warfare.

Vargas allayed much of the political unrest in Brazil by convening (1933) a constituent assembly. Among the features of the new constitution adopted (July, 1934) by this body were sections curtailing States' rights and providing for the franchise for women, social security for workers, and for the election of future presidents by the congress. On July 17, 1934, Vargas was elected president.

In the first year of his constitutional administration Vargas encountered considerable opposition from the radical wing of the Brazilian labor movement. Abortive communist-led revolts occurred in Pernambuco and Rio de Janeiro in November, 1935. Martial law was declared, and Vargas was authorized by the congress to rule by decree. Mass arrests of radicals and other opponents of the government followed. Popular discontent soon attained grave proportions, with a newly formed fascist organization (*Integralista*) winning broad support among the Brazilian middle class. This group, which won wide support among the German-speaking, pro-Nazi groups in southern Brazil, soon became a center of antigovernment activity. On Nov. 10, 1937, almost on the eve of the presidential election, Vargas dissolved the congress and proclaimed a new constitution vesting his office with absolute, dictatorial powers. He reorganized the government according to the corporative principles of totalitarian Italy and Germany, abolished all political parties, and imposed censorship of the press and mails. The Vargas government, officially styled *Estado Nove* ("New State"), was to continue in office pending a national plebiscite on the new organic law. No date was set for the plebiscite. Through a series of decrees extending greater social security to the plantation workers Vargas mobilized the support of a large section of the population. The only serious challenge to his regime came from the *Integralistas,* who staged a revolt on May 11, 1938. The uprising was crushed within a few hours.

Despite the totalitarian character of his regime, Vargas perpetuated Brazil's traditional policy of maintaining friendly relations with the United States and the other democracies of the Western Hemisphere. Conversely, his government was openly hostile to the European dictatorships, in particular the Third Reich. The propaganda and organizational activities of German agents in Brazil were partly responsible for the anti-Nazi diplomacy of the Vargas government. Early in 1938, after evidence of Nazi complicity in the *Integralista* revolt had been uncovered, Vargas



O.I.A.A.Photo

Cathedral of St. John the Baptist, in the town of Caratinga, Minas Geraes, Brazil

imposed severe restrictions on German nationals in Brazil. The consequent friction between Brazil and the Third Reich led (October, 1938) to a temporary break in diplomatic relations. In 1939, shortly before Germany began World War II, Brazil concluded a far-reaching economic accord with the United States.

Brazil maintained a policy of neutrality in World War II until Dec. 7, 1941, when the Japanese attacked Pearl Harbor. Solidarity with the United States was proclaimed immediately after the attack, and the government opened its ports and airfields to the American armed forces. On Jan. 28, 1942, Brazil severed diplomatic relations with the Axis Powers and on Aug. 22, 1942, declared war on Germany and Italy. With American economic aid, the country swiftly embarked on a vast program of industrial expansion, giving special emphasis to increased production of rubber and other vital war materials. The Brazilian military establishment, drawing heavily on American lend-lease supplies, was rapidly enlarged. Naval bases and airfields, constructed at strategic coastal points, became important centers of Allied antisubmarine warfare in the South Atlantic Ocean. The Brazilian navy eventually assumed all patrol activities in the South Atlantic, freeing U.S. warships for action against Japan. In 1944–45 a Brazilian expeditionary force participated in the Allied campaign in Italy; and on June 5, 1945, Brazil formally joined the war against Japan. Later that month it became a founding member of the United Nations.

Meanwhile, manifestations of dissatisfaction with the Vargas dictatorship had become increasingly frequent on the domestic political scene. Defiant action in February, 1945, by a group of influential publishers forced the government to relax censorship of the press. On Feb. 28 the government announced that congressional and presidential elections would be held later in the year. The announcement was followed by gradual abrogation of all major restrictions against political activity. Amnesty for all political prisoners, including communists, was decreed on April 18.

During the election campaign Vargas supported his war minister Enrico Gaspar Dutra for the presidency. However, as the campaign progressed, a series of unpopular executive orders created widespread fears that Vargas intended to resume the dictatorship. The re-

sultant crisis was resolved by a military *coup d'état* on Oct. 29. Vargas was forced to resign, and on the next day José Linhares, chief justice of the Supreme Court, was appointed head of the provisional government. The national elections were held on Dec. 2, as scheduled. Dutra won the presidency by a large plurality and was inaugurated on Jan. 31, 1946. Acting as a constituent assembly, the newly elected congress convened on Feb. 2 and began the drafting of a new constitution (adopted on Sept. 17).

Inflationary prices, acute distress among the lower-income groups, and a mounting strike wave were among the chief problems inherited by the Dutra administration. Rioting took place in many parts of the country during 1946. Responsibility for the disorders was attributed by the government to the Brazilian Communist Party, which had emerged from the elections as the country's fourth-largest political organization. In February, 1947, the government instituted proceedings against the Communist Party before the Supreme Electoral Tribunal, a high federal court. The Court's decision, rendered a few months later, held that the party was illegal on various constitutional grounds, including the guarantees of fundamental human rights.

During the summer of 1947 Petropolis, Brazil, was the site of the International (Pan-American) Conference for the Maintenance of Peace and Security. The Inter-American Treaty of Reciprocal Assistance, drafted by the conference, was signed by Brazil on Sept. 2. A provision of the treaty stipulates united defense by the signatories against armed aggression directed at any nation of the Western Hemisphere. See Rio de Janeiro, Treaty of.

In October, 1947, the Brazilian government severed diplomatic relations with the Soviet Union. Provoked by a Soviet magazine article which referred to President Dutra as a puppet of the United States, the move was approved by a large majority in the Brazilian congress. A few months later the congress voted to expel from office all communists holding elective positions. Among legislators affected by the measure were one senator and fourteen deputies.

The Brazilian economic crisis, severely aggravated by a serious U.S. dollar deficit, persisted through 1948 and 1949. In May, 1948, the government asked congressional approval of a five-year plan aimed at the further modernization of the nation's economy. Because of the estimated cost (nearly a billion dollars), the congress reacted coolly to the proposal. The Brazilian government concluded a favorable trade agreement with the United Kingdom in August, 1949. Trade pacts with other European countries and with most of the nations of South America were also negotiated during 1949. Congress approved the five-year plan in 1950.

The chief political events of 1950 in Brazil centered around the presidential election, scheduled for Oct. 3. Vargas was named as the candidate of the Brazilian Labor Party. The administration-sponsored Social Democratic nominee was Cristiano Machado, a member of the House of Deputies. General Eduardo Gomez, who had been defeated by Dutra in the previous election, headed the ticket of the Democratic National Union. Vargas' antidemocratic record figured prominently in the campaign waged by his opponents. The former dictator, describing himself as a centrist opposed to communism and fascism, pledged more social security, lower living costs, modernization of the countryside, a faster rate of industrialization, and co-operation with the United States. He was elected by a large plurality over Gomez, who ran second. Blank ballots were cast by members and supporters of the outlawed Communist Party.

Inaugurated on Jan. 31, 1951, Vargas formed a coalition cabinet representative of all the major parties. His government took immediate steps to balance the budget and developed a legislative program designed to reduce living costs, increase wages, and extend social reforms. In July the Brazil-United States Economic Development Commission, established under the Point Four Program (q.v.), began a two-year study of the electric-power, transportation, mining, and agricultural needs of the country. Inflation and high living costs persisted during 1952, and the economic crisis was further aggravated by a mounting foreign-trade deficit and declining markets.

The Communist Party intensified its underground activities and press campaign against the government during the year, and evidence that Red agents had infiltrated the military establishment led (March) to the resignation of the minister of war. On March 15 Brazil and the United States signed a mutual military-aid pact.

The upsurge of communist activity in Brazil was paralleled by a sharp revival of nationalism. Fundamentally anti-United States in character, nationalist sentiment was most concretely manifested in 1952 by enactment

(September) of legislation nationalizing Brazilian petroleum resources.

In February, 1953, the government secured a $300 million loan from the U.S. Export-Import Bank to ease the heavy dollar deficit. The economic crisis worsened, however, and in June, as a result of widespread criticism of the government's policies, Vargas replaced several of his ministers. In November the government announced an "austerity" program, with provisions for higher taxes, stricter import controls, and increased exports.

During the first half of 1954 anti-Vargas conservatives became increasingly critical of the government's prolabor policies and its hostilty to foreign capital. On Aug. 5, during the congressional election campaign, an air force officer was killed in the attempted assassination of an anti-Vargas newspaper editor. The killing precipitated a government crisis, during which army and air force generals demanded that Varga resign. Early on Aug. 24 Vargas agreed to relinquish power temporarily in favor of Vice-President João Café Filho (1899–). Vargas committed suicide a few hours later. Widespread pro-Vargas, anti-American demonstrations, including several that were allegedly Communist-inspired, took place in various areas following the announcement of his death.

During the summer of 1955 Brazil experienced the worst drought in thirty years. In nationwide presidential elections held on Oct. 3 Juscelino Kubitscheck, former governor of Minas Gerais, who had the support of the late president Vargas' followers and the endorsement of the Communists, won by an impressive plurality. Shortly afterward President Café took a leave of absence because of ill-health. Pro-Kubitschek forces ousted Café's successor, Acting President Carlos Coimbra da Luz, on Nov. 11, and installed the Brazilian legislator Neuru Ramos as acting president. In January, 1956, President-elect Kubitschek visited the United States. He addressed the U.S. Senate during his visit and pledged opposition to "extremist ideologies". Kubitschek was inaugurated on Jan. 31. Subsequently he proclaimed an ambitious five-year plan for economic development and announced the elimination of visa requirements for U.S. citizens traveling in Brazil. On July 30, 1956, the U.S. Export-Import Bank granted to Brazil loans totaling more than $150 million.

BRAZILIAN PLUM. See HOG PLUM.

BRAZIL, ISLAND OF. See MYTHICAL ISLANDS.

BRAZIL NUTS, the edible seeds of certain trees of the family Myrtaceae, particularly *Bertholletia excelsa.* The tree, which reaches a height of 120 ft., grows southward from the valley of the Orinoco through the Amazon basin to several of the river valleys south of the Amazon. It produces a round, woody seed vessel, as large as a man's head, in which lie about 24 seeds. The seeds are triangular, with a wrinkled, hard shell enclosing an oily white kernel. They are an important export from the northern states of Brazil, particularly Pará.

BRAZILWOOD or **BRAZIL,** names applied to various trees of the genus *Caesalpinia,* to the wood produced by them, and to a dyestuff obtained from the wood. The wood is known also as Nicaragua wood, hypernic, or brazilette, terms also applied to logwood (q.v.). Brazilwood is extremely hard, but it has been valued chiefly for the dye derived from its narrow heartwood. The heartwood is ground to a coarse powder from which the dye, brazilin, $C_{16}H_{14}O_5$, is extracted with water. Brazilin is yellow in color, but when exposed to air or treated with alkali it is oxidized to brazilein, $C_{16}H_{12}O_5$, the dark red coloring matter called brazilwood. Commercially this dye has been largely replaced by synthetic dyestuffs.

Brazilwood was known in the Middle Ages and gave its name to a legendary island in the Atlantic and later to the country of Brazil. The best type of brazilwood, Pernambuco wood, is derived from a Brazilian tree, *C. echinata.* Other types produced in South and Central America and the West Indies are called All Saints' wood, St. Martha wood, and various other names, and are principally derived from *C. brasiliensis.* In the East Indies *C. sappan,* and in the West Indies *C. vesicaria* (also called brasiletto) and *C. crista* yield other varieties of brazilwood. See SAPANWOOD.

BRAZING, a type of welding (q.v.) using a filler metal or alloy with a melting point lower than that of the metals joined. Brazing is similar to soldering, but the distinction is usually made that solder (q.v.) melts at less than 1000° F. (537° C.).

Various methods of brazing are practiced, differing in the type of filler metal used. In *hard soldering* or *silver soldering* the filler is an alloy of silver and copper or silver and zinc which melts between 1175° and 1500° F. (635–816° C.). *Brazing spelter* is another type of filler, an alloy of approximately equal parts of copper and zinc, melting at 1600° F. (871°

C.). Pure copper is the filler used in *copper brazing*. It melts at 2050° F. (1121° C.). *Bronze welding* is actually a form of brazing. In this process a number of different alloys, mostly based on a mixture of about 60% copper and 40% zinc, are employed as filler materials. Their melting points range from 1500° to 2000° F. (816°–1093° C.). In recent years special fillers have been developed for the brazing of aluminum and magnesium and their alloys. In mass production, furnaces are often used to heat the parts to be brazed, or the parts are brazed by dipping in baths of molten filler alloys. For single, nonrepetitive operations, the joint is usually heated with a gas, oxyacetylene or oxyhydrogen torch.

BRAZOS, one of the largest rivers of Texas, formed by the junction of Clear and Salt forks, in Young County. It flows southeast and empties into the Gulf of Mexico about 40 miles S.W. of Galveston. It is about 900 miles long and drains an extensive area. It is navigable during high water for a distance of 300 miles from its mouth and at all times to Columbia, 40 miles from the Gulf.

BRAZZAVILLE, port and capital city of the Overseas Territory of French Equatorial Africa. The city is situated in the Middle Congo Colony, a short distance above Livingstone Falls on the N. shore of Stanley Pool of the Congo River, opposite Léopoldville, Belgian Congo. Brazzaville is connected by railway with Pointe-Noire, a port and the capital of the Middle Congo Colony, on the Atlantic Coast, and by river steamers with all the major ports on the Congo above Stanley Pool. The city is an important telegraph and radio communications center. Brazzaville was founded as a supply base about 1880 by Pierre Savorgnan de Brazza, a French explorer. Pop. (1950 est.) 83,400.

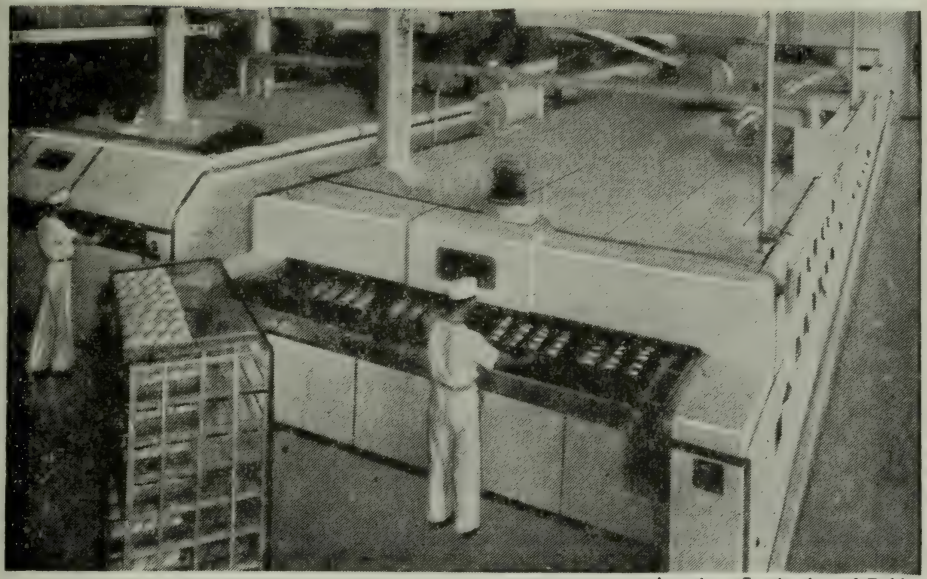
BREACH OF CONTRACT, in law, the failure, deliberate or unintentional, to do any lawful thing which one has bound himself by contract to do. Not every nonperformance, however, results in a breach of contract. In certain cases, if the contractor has acted in good faith and has performed substantially all his obligations, the courts have held that mere deviation from the contract does not constitute a breach.

To constitute a breach of contract it is not necessary that a demand of performance be made, either before or after default, and that such performance be formally refused. Indeed, it is now settled in England, in the United States Supreme Court, and in the courts of many of the States of the United States, that one may be guilty of a breach of contract before the time for its performance has arrived. For example, a person may contract to sell and convey certain property at a future time; if, before that time, he sells and conveys the property to a third person, he is liable to an action for damages for a so-called "anticipatory breach of contract".

The consequences of a breach depend on the nature of the contract and upon the character of the breach. The usual remedy is an action for damages sustained by reason of the breach. In a comparatively few instances, as in cases involving the sale of real estate or articles of personal property of unique and irreplaceable character, the aggrieved party may have the additional remedy of specific performance, an equitable remedy in which the court, by decree, compels the offending party to transfer title to the real estate or personal property involved. In event the decree is not complied with, the offending party is guilty of contempt of court and liable to fine and imprisonment. See CONTRACT.

BREACH OF PROMISE, popular expression for the violation of an agreement to marry. The agreement of a man and woman to marry is considered in the law as a simple contract, and is governed by the same principles. It requires no particular legal formality and does not have to be in writing. Such a contract made by a minor who has reached the age of consent is not void, but is voidable by him if he so chooses. The remedy for a breach of the agreement is an action by the other party for damages. Recently, however, a number of States of the U.S. have adopted laws prohibiting actions for damages for breach of promise.

BREAD, staple article of food, made by baking a mixture of flour or meal, water or milk, and certain other ingredients. The sources of bread flour include wheat (the grain most commonly used), rye, barley, corn, rice, potatoes, and soy beans. Depending on the ingredients used, bread is either leavened or unleavened. Leavened bread, which is the most popular variety in almost all countries, is made by combining leaven with the other ingredients, usually sugar, salt, and shortening, in addition to flour and liquid. Consisting generally of yeast, which acts by the process of fermentation (q.v.), leaven generates tiny bubbles of carbon-dioxide gas in the mixture (dough), distending or "raising" it and making it light and porous. The dough is then thoroughly kneaded, set aside for further rising, shaped, and baked. Chemical leavening



American Institution of Baking

Large, modern bread-baking plant. Each automatic oven bakes hundreds of loaves per hour.

agents, notably baking powder, are sometimes used in the preparation of leavened bread. In this method distention of the dough is accomplished by the interaction of carbonates and acids, considerably reducing the time required by the yeast process. Unleavened bread, as indicated by the name, contains no leaven. Made of a mixture consisting essentially of flour and liquid, it is best known as matzoth, originated by the Israelites and eaten at Passover. Among other types of unleavened bread are the dampers of Australia, Indian corn bread, and Swedish rye bread.

Preparations of baked grain products have been used as food since prehistoric times. The first "bread" foods were probably made from acorns or beechnuts, crushed, and mixed with water, and subjected to natural or artificial heat to consolidate the grain into a cake. Fragmentary portions of unleavened bread, made of grain, have been unearthed in the ruins of the Swiss Lake Dwellers, builders of the earliest-known civilized communities of Europe. Among the ancient Egyptians the craft of baking was known before the 20th century B.C. The bakers of ancient Greece were world famous. In Rome public ovens were established in the time of the Republic. Bread was made chiefly in the home or in the small neighborhood bakery, however, until the end of the 19th century A.D., when the trend to "factory" bakeries began. At that time manual labor was superseded in many of the operations in bread making by machinery, including mixing machines; chain conveyors for carrying dough through temperature-controlled areas during the raising periods; automatic baking ovens; and cooling, slicing, and wrapping machines. Certain modern innovations cannot be regarded as improvements, however; for example, changes in the process of flour milling, mainly to produce a whiter flour, eliminated many of the natural vitamins and minerals of the grain, and during World War II the U.S. government required, as a public-health measure, the enrichment with vitamins and minerals of all bread offered for public sale. After the war such regulation reverted to State control. The Federal Trade Commission estimates that the United States consumes yearly some 15 billion pounds of bread. Of this total, white bread constitutes about 70 percent; whole-wheat bread, rye bread, and pumpernickel form most of the remainder. See FLOUR; WHEAT.

BREADFRUIT, common name for tropical trees of the genus *Artocarpus* in the Mulberry family, and for their fruit. *A. incisa,* the common breadfruit tree, is one of the most important plants of the islands of the South Pacific Ocean, prized especially for its fruit, which is the principal staple food of the area. The fruit ranges from 4 to 8 inches in diameter, and has a rough rind and a white, mealy

pulp. Baked breadfruit is somewhat sweet, with a texture intermediate between that of bread and potatoes; breadfruit flour is used for biscuits, bread, and puddings. The breadfruit tree grows to a height of about 40 feet, has leathery, incised leaves 1 to 3 feet in length, and bears male and female flowers in separate clusters. Cloth is made from its inner bark, and furniture and canoes are made from the soft, light wood. The milky sap is the basic ingredient of a waterproofing compound.

BREAKSPEAR. See ADRIAN IV.

BREAKWATER, a barrier of solid construction built out into the open water of a sea or lake to break the force of the waves and provide a smooth anchorage or calm water for docking. Breakwaters should be distinguished from jetties since the primary purpose of the latter is to direct the flow of a river so that it will scour the channel free of sand and silt. Occasionally a breakwater is designed to fulfill the purpose of a jetty as well, but in general, harbors behind breakwaters are dredged. See HARBOR.

Breakwaters may be attached to the land or separated from it, and have been constructed in a great variety of forms to suit local conditions. They can be built of stones and rubble, of masonry, or of a combination of both. Breakwaters were known to the Greeks and Romans and have been used throughout the world. Breakwaters have been highly developed on the Great Lakes, but they are not necessary in the best U.S. ocean harbors. During World War II, an enormous breakwater of sunken ships and caissons was constructed by the Allies off the Normandy beachhead in June, 1944, but was destroyed in the same month by a storm.

BRÉAL, MICHEL JULES ALFRED (1832–1915), French philologist, born in Landau, Rhenish Bavaria, of French parents. He was educated at Weissenburg, Metz, Paris, and Berlin. In 1864 he was appointed professor of comparative grammar at the Collège de France and from 1879 to 1888 was an inspector general of higher education. Bréal is generally considered the founder of the science of semantics, the systematic and scientific study of the development of the meaning of words. The first work on this subject was his *Essai de Sémantique: Science des Significations* (1897). He was also the author of *L'Étude des Origines de la Religion Zoroastrienne* (1862), *Le Mythe d'Œdipe* (1864), *Deux Études sur Goethe* (1898), and *Pour Mieux Connaître Homère* (1906).

BREAM, name applied to a variety of fishes belonging to different families. The common English bream, or carp bream, *Abramis brama,* in the Cyprinidae family, is about 12 inches in length and inhabits many rivers and lakes of Europe. The white bream, *A. blicca,* is a related species, somewhat smaller, found in the same range. In North America a minnow, the golden shiner, *A. chrysoleucas,* and a sunfish, the "pumpkin seed", *Lepomis gibbosus,* in the Centrarchidae family, are commonly called "breams". The term "sea bream" is applied to various salt-water fish, notably the porgies, in the Sparidae family, and fish of the genus *Brama.*

BREASTED, JAMES HENRY (1865–1935), American Orientalist and historian, born in Rockford, Ill. He was educated at North Central College, Naperville, Ill., Chicago Theological Seminary, Yale University, and the University of Berlin. The University of Chicago appointed him as assistant in Egyptology in 1894. In 1905 he became professor of Egyptology and Oriental history at the university and director of its archeological expedition to Egypt. He became chairman of the university's department of Oriental languages and literature in 1915. Appointed director of the Oriental Institute of Chicago in 1919, he headed the institute's first archeological survey of Egypt and Western Asia (1919–20). He was president of the American Oriental Society (1918), of the History of Science Society (1926), and of the American Historical Association (1928); and was associate editor of the *American Journal of Semitic Languages.* The Rosenberger gold medal was awarded to him in 1929 in recognition of his work on the history of civilization. He is the author of numerous books, including the standard textbook *A History of Egypt* (1905); *Outlines of European History* (with J. H. Robinson, 1914); *Ancient Times, A History of the Early World* (1916); *Survey of the Ancient World* (1919); *Oriental Forerunners of Byzantine Painting* (1924); *Victorious Man* (1926); *Conquest of Civilization* (1926); *Edwin Smith Surgical Papyrus* (2 vols., 1930); and *The Dawn of Conscience* (1933).

BREATHING. See RESPIRATION.

BRÉBEUF, JEAN DE (1593–1649), French Jesuit saint and missionary in America. He arrived in the New World with Champlain in 1626, and his labors were mainly among the Huron Indians in Canada. When the town of St. Louis was taken by the Iroquois, Brébeuf and Lalemont, his associate, were made prisoners and tortured to death. It is said that

Brébeuf's skull is preserved in the pediment of a silver bust in the convent of the hospital nuns in Montreal. He was canonized in 1930.

BRECHIN, burgh of Angus County, Scotland, situated on the South Esk R., about 8 miles w. of Montrose. The chief industries are distilling, bleaching, iron casting, and the manufacture of paper, linen, sailcloth, and rope. Noteworthy edifices include a massive tower, dating from about 1000, and a 13th-century cathedral. The Scottish king David I made Brechin an episcopal see in 1150. During the Scottish wars for independence from England forces under the English king Edward I captured (1303) the burgh after a twenty-day siege. A Parliamentarian stronghold during the Great Rebellion, it was burned (1645) by Royalists under James Graham, Marquis of Montrose. Pop. (1951 prelim.) 7264.

BRECKINRIDGE, John Cabell (1821–75), American lawyer, soldier, and political leader, born near Lexington, Ky., and educated at Centre College and Transylvania University. He interrupted (1847) his law practice after the outbreak of the Mexican War and entered the U.S. Army with the rank of major. After the war he was elected to the Kentucky legislature; from 1851 to 1855 he served in the U.S. House of Representatives. Breckinridge was elected Vice-President of the United States in 1856 on the ticket with James Buchanan, standard-bearer of the Democratic Party. A leading spokesman of the proslavery faction of the Democratic Party, he was nominated for the Presidency by that faction in 1860, but lost the election to the Republican candidate Abraham Lincoln. The Kentucky legislature elected him to the U.S. Senate in March, 1861. Shortly after the opening of hostilities between the Confederacy and the Federal government, he joined the Confederate army. Breckinridge was made a major general in 1862, subsequently took a prominent part in the battles of Shiloh, Murfreesboro, Chickamauga, Chattanooga, and Cold Harbor, and was General Jubal Anderson Early's second in command during the Shenandoah campaign (1864). From January to April, 1865, he was secretary of war in the cabinet of the Confederate president Jefferson Davis. At the close of the conflict he escaped to Europe, where he remained until 1868. He returned to Kentucky in that year and thereafter devoted himself to the practice of law.

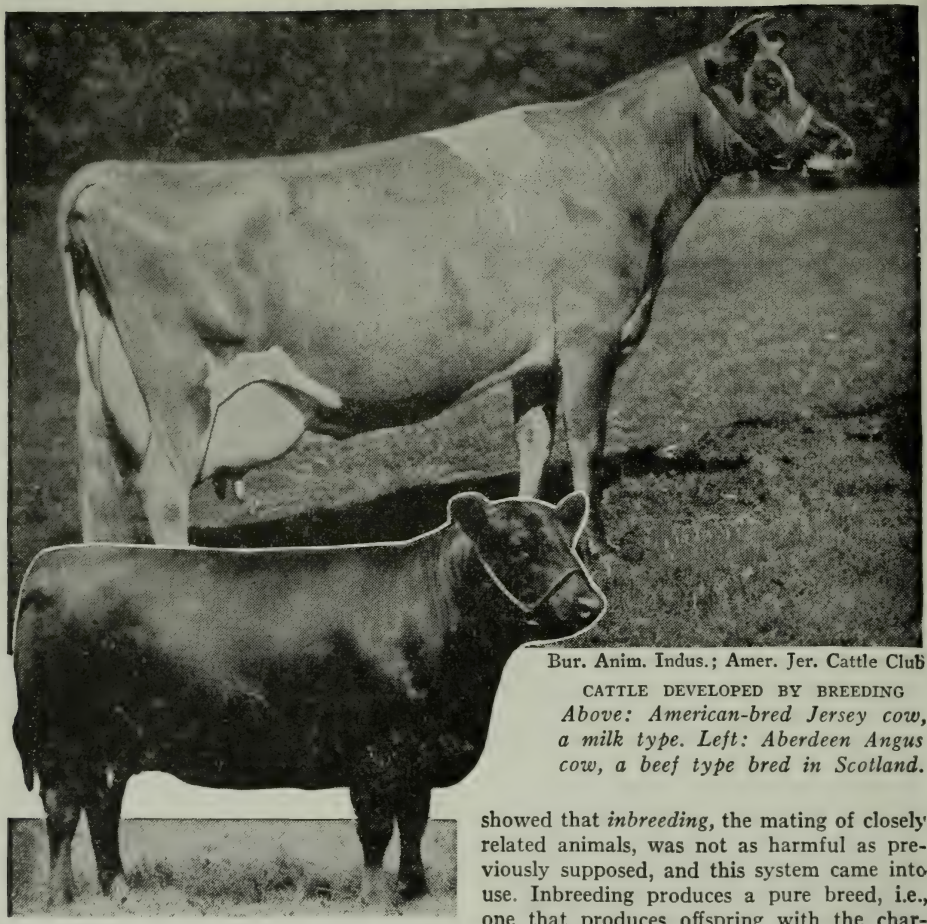
BRECKNOCKSHIRE or **BRECONSHIRE,** sometimes Brecknock or Brecon, inland county of Wales. It is generally mountainous, particularly in the s. portion, which is dominated by the massif known as Brecon Beacons. Pen y Fan (2907 ft.) is the highest summit. The principal streams are the Usk and Wye rivers. Livestock breeding, textile manufacturing, coal mining, and limestone quarrying are the chief industries. Brecknock (pop., 1951 prelim., 6466) is the county seat. Area, 733 sq.m.; pop. (1951 prelim.) 56,484.

BREDA, city of the province of North Brabant, the Netherlands, situated at the confluence of the Merk and Aa rivers, 50 m. by rail N.E. of Antwerp, Belgium. It is an industrial center, with plants engaged in the manufacture of cigars, carpets, and textiles. Among the chief points of interest are a 13th-century church, in the Gothic architectural style, and a 14th-century castle. Breda was founded prior to the 12th century. Strongly fortified early in the 16th century, it was the center of considerable fighting in later times, notably during the Dutch wars of liberation against the Spanish and during the French Revolutionary Wars. The English monarch Charles II resided in the city during his exile. In April, 1660, before his restoration, he issued from Breda the amnesty proclamation which is known as the *Declaration of Breda.* The city was heavily bombed and captured by the Germans in May, 1940, during World War II. It was liberated by the British in October, 1944. Pop. (1953) 94,287.

BREDERO, Gerbrand Adriaanszoon (1585–1618), Dutch playwright and poet, born in Amsterdam. He achieved distinction as a lyric poet, and ranked among the foremost Dutch writers of comedy. Among his best-known plays are *Het Moortje* (1615), *Stomme Ridder* (1618), and *Spaansche Brabander Verolimo* (1618).

BREEDING, the controlled reproduction of domestic animals and plants so as to produce varieties possessing desirable characteristics. Breeding makes use of the natural tendency of plants and animals to produce individuals with variant characteristics which may be transmitted to their offspring (see Mutation; Heredity). Selective mating through successive generations of individuals possessing desirable qualities in a marked degree produces a variety sufficiently different from the parent stock to constitute a distinct breed.

Animal Breeding. The breeding of animals has been practiced from the earliest times. Until the beginning of the 20th century so few underlying principles could be deduced from the many experiments recorded by breeders, that a scientific basis could not be formulated. With the application of Mendel's principles of



Bur. Anim. Indus.; Amer. Jer. Cattle Club

CATTLE DEVELOPED BY BREEDING

Above: American-bred Jersey cow, a milk type. Left: Aberdeen Angus cow, a beef type bred in Scotland.

heredity positive results have been obtained, and it is now possible to determine with a reasonable degree of accuracy which qualities may be inherited (see MENDEL'S LAW). Scientific advances have shown that favorable environmental factors are essential for the full development of these hereditary qualities. Systematic investigation of the scientific principles of breeding is carried on by the Bureau of Animal Industry and the Bureau of Dairy Industry of the U.S. Department of Agriculture and by various breeders' and stock raisers' associations.

Several systems have been employed in the selection of animals for breeding. *Mass breeding*, by random mating of a group of individuals selected for their desirable characteristics, generally results in a limited improvement of the herd, but is not dependable. In the 19th century Robert Bakewell showed that *inbreeding*, the mating of closely related animals, was not as harmful as previously supposed, and this system came into use. Inbreeding produces a pure breed, i.e., one that produces offspring with the characteristics possessed by the parents, but, after several generations, a recession of vigor and fertility sets in. This disadvantage may be overcome by *line-breeding*, which involves the mating of individuals, which, though not closely related to each other, are from related lines or families. Line-breeding is the system in common use among raisers of pure-bred cattle. *Outcrossing*, the coupling of different breeds or different species, results in a first-generation improvement called hybrid vigor, and is used to produce types adapted to particular conditions of climate, food supply, or work. The offspring of an outcross between different species are, however, frequently incapable of reproduction (see HYBRID; MULE).

The different breeds of domestic animals are described in separate articles. See CAT; CATTLE; DOG; FOWL; HOG; HORSE.

Plant Breeding. In plant breeding, as in animal breeding, the objective of the breeder

is the development and fixation of desirable characteristics. Variations may be produced naturally (see articles POLLINATION; MUTATION), or artificially, by treatment of the developing seed with chemicals or radiation. To fix the variation, herbs (nonwoody plants) must generally be bred through several generations, with careful selection of seed, until a pure breed is produced. This process is unnecessary with trees and shrubs, which may be propagated by vegetative methods such as cutting and grafting (q.v.).

The oldest method of plant breeding, practiced universally since the early days of agriculture, is the selection of seed from the best plants of the crop. Improvement of plants by deliberate crossing, i.e., the controlled pollination of one plant by another of the same species, was introduced about the beginning of the 18th century. The characteristics of cross and hybrid varieties can now be predicted with reasonable accuracy by the application of Mendel's Law.

Plant hybrids, like animal hybrids, are frequently sterile. In other cases, they cannot be made to breed true. *First-crop hybrids,* however, are valuable in agriculture. Pure strains, obtained by close inbreeding, are crossed to produce a seed with the desired characteristics. None of the plants from such seed are used for seed again, the hybridization being repeated for each successive crop. See BOTANY: *Genetics*; PLANT BREEDING; VARIATION.

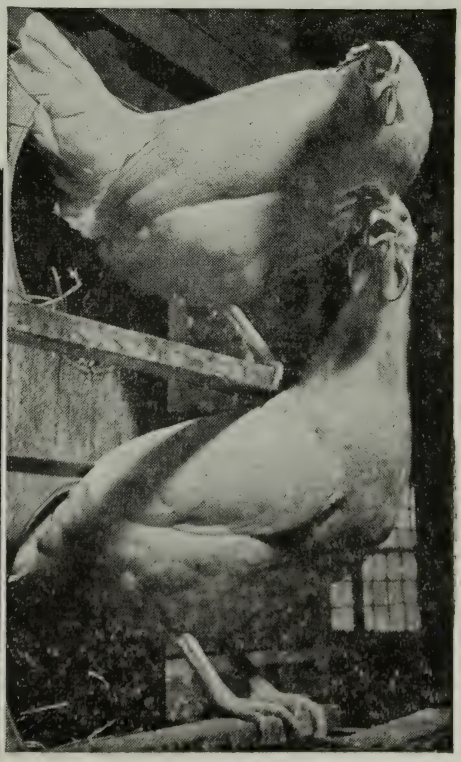
BREED'S HILL, height in Charlestown, Boston, Mass., overlooking Boston harbor. On Breed's Hill took place (June 17, 1775) the Battle of Bunker Hill (see BUNKER HILL, BATTLE OF), the first severe engagement of the American Revolution. It is the site of Bunker Hill Monument, which commemorates the battle. Bunker Hill (q.v.) adjoins Breed's Hill on the N.

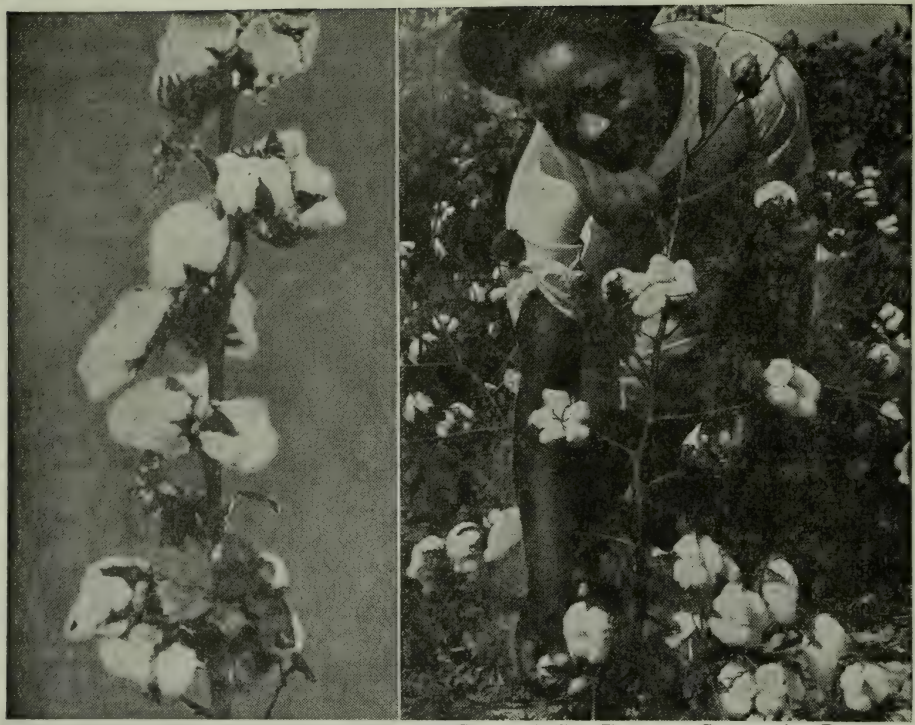
BREHON LAWS, name generally applied to the ancient legal system of the Irish people. The brehons (Gaelic, *breitheamh*) were hereditary judges, who performed their functions in the open air seated upon sods, on some place of eminence. They did not disappear till about the middle of the 17th century. The poet Edmund Spenser, in his *View of the State of Ireland* (1596), gives a detailed although inaccurate account of the Brehon Laws. The two most important collections of these laws known today are the *Senchus Mòr* or "Great Book of the Ancient Law" attributed to St. Patrick, and the "Book of Aicill".

CHICKENS DEVELOPED BY BREEDING

Below: Barred Plymouth Rock, an excellent general-purpose fowl, for meat and eggs. Right: White leghorns, valuable egg layers.

Successful Farming; U.S.D.A.





Anderson, Clayton & Co.; Tennessee Conservation Department

BREEDING NEW PLANT FORMS TO SUIT MAN'S NEEDS. *The cotton plant at left has been bred with bolls close to the stalk for easier mechanical harvesting. At right, cotton picker harvesting bolls from the common, irregularly branched plant.*

In accordance with the royal commission issued in 1852, all the surviving manuscripts have been collected and edited with an English translation and glossary in six volumes, under the title of *The Ancient Laws and Institutes of Ireland* (1865–1901). In several ways the Brehon Laws are remarkable. They show the existence of a complete legal system among the Celtic peoples at a very early period. The minuteness of the rules laid down upon every subject affecting the life of all ranks of the people throws an important light on ancient Irish civilization. The efforts of St. Patrick and other Christian saints were apparently not altogether successful in abolishing the power of paganism, for the laws contain institutions which reflect the image of the old Celtic religion. In legal history these laws are noteworthy, as apparently the brehons were accustomed to make authoritative and binding interpretations and commentaries upon them.

BREIT, GREGORY (1899–), American physicist, born in Nicolaiev, Russia, and educated at Johns Hopkins University. He was brought to the United States in 1915, and was naturalized in 1918. He was professor of physics at New York University from 1929 to 1934, at the University of Wisconsin from 1934 to 1947, and at Yale University after 1947. During World War II he made important contributions to the national-defense program, notably the degaussing project for protecting U.S. ships from magnetic torpedoes and mines, the atom-bomb project, and the Ordnance Department's proximity-fuze project (see FUZE: *Proximity Fuze*).

BREITENFELD, BATTLE OF, name given to two battles of the Thirty Years' War, fought near the village of Breitenfeld, Saxony, East Germany. **1.** A battle (September 17, 1631) between an Allied Protestant army of Swedes and Saxons commanded by King Gustavus Adolphus of Sweden and a Catholic army of the Holy Roman Empire under the Flemish field marshal Johan Tserclaes Tilly. Some 70,000 men were engaged in the action, which was won by the Protestant forces.

2. A battle (November 2, 1642) between a Swedish army under General Lennart Torstenson and a Holy Roman imperial army commanded by Octavio Piccolomini, Duke of Amalfi, and Archduke Leopold William of Austria. Torstenson's army won a decisive victory.

BREITMANN, HANS. See LELAND, CHARLES GODFREY.

BREMEN, State of West Germany, comprising the capital city of Bremen (q.v.) and surrounding territory; the town of Hemelingen, about 7 miles S.E. of the capital; and the port of Bremerhaven, about 38 miles N.E. of the capital. The State forms an enclave within the West German State of Lower Saxony and, except for a narrow strip of territory opposite its capital, lies along the E. bank of the Weser R. Physiographically, the State consists mainly of lowlands. The principal industries are shipping and related enterprises, which center in the cities of Bremen and Bremerhaven. Fishing, cattle raising, and the growing of vegetables are other occupations.

In 1815, by the terms of the Treaty of Vienna, which ended the Napoleonic Wars, the city of Bremen was designated a free State (*Freie Hansestadt Bremen*). Bremen entered the Germanic Confederation (q.v.) in the same year. The State later acquired additional territory, notably (1826) part of the exclave of Bremerhaven, and adopted (1849) a republican form of government. It joined the North German Confederation (q.v.) in 1866. With the formation (April, 1871) of the German Empire, Bremen became one of its constituent States. It participated in the establishment of the German (Weimar) Republic after the collapse of the empire in World War I. Following the creation (1933) of the totalitarian Third Reich, the State was deprived of its sovereign status and placed under the control of the central government. It was allocated to the American Zone of Occupation after the defeat of the Third Reich in World War II, and thus formed an enclave within the British Zone of Occupation. Under the American occupation authorities certain revisions of the State's former boundaries resulted in the acquisition of nearly 57 sq.m. of additional territory. Self-government was restored in 1946, and in 1950 Bremen became a constituent State of the newly established West German Republic. Area, 155.9 sq.m.; pop. (1950) 558,619.

BREMEN, capital of the State of Bremen, West Germany, situated on both banks of the Weser R., 46 m. from the North Sea and 71 m. by rail S.W. of Hamburg. The city is divided into the *Altstadt* (old town) and its suburbs, on the right bank of the Weser, and the *Neustadt* (new town) and suburbs, on the left bank. Old Bremen retains many medieval features, such as narrow, crooked streets and gabled houses. Notable among its edifices are the 12th-century Cathedral of St. Peter, in the Romanesque architectural style; the 15th-century *Rathaus* (town hall), in the Gothic style; and the *Schütting* (merchants' hall) dating from the 17th century. The new town is well-planned, with modern houses and shops. The two sections of the city are connected by three bridges. Bremen is accessible to vessels drawing up to 25 ft. of water and has extensive cargo-handling and railway-transportation facilities. With Bremerhaven, the city's port of entry for deeper-draught vessels, it ranks second only to Hamburg among German ports. The city is the second-largest cotton market in Europe and is the center of a large import trade in tobacco and rice. Among other important imports are lumber, coal, grain, metals, jute, coffee, fish, and cottonseed. The principal exports are machinery, iron products, glass, linens, woolen goods, cement, wire, and toys. Shipbuilding is the chief industry. Other industries include sugar refining, brewing, and the manufacture of rope, chemicals, tobacco products, foodstuffs, and jute products.

A missionary center during the campaigns of the Frankish emperor Charlemagne to Christianize the pagan tribes of N. Germany, Bremen became an episcopal see in 787. In 848, following the destruction of Hamburg by the Normans, the archiepiscopal see of that city was transferred to Bremen. The archbishop of Bremen was empowered (956) by the Holy Roman emperor Otto I to govern the town and to establish a market there. In the course of the next 450 years Bremen emerged as one of the leading commercial cities of Europe. Its citizens waged a constant struggle for self-government during this period, initially against the archbishop and later against the rising class of wealthy mercantilists. Freedom from clerical rule was secured about the middle of the 14th century. The mercantile class, overcoming the resistance of the common people after a protracted struggle, finally won political control of the city in 1433.

The Protestant Reformation had numerous supporters in Bremen. In 1532 the city joined the Schmalkaldic League, an alliance against the Holy Roman Empire. Bremen won recog-

nition as a free imperial city in 1646 (see FREE CITY). By the terms of the Peace of Westphalia (1648), which ended the Thirty Years' War, it became a Swedish possession. Bremen revolted against Swedish rule in 1666 and won autonomy, but complete independence was not secured until 1741. In 1806, during the Napoleonic Wars, the city was seized by the French, and was held by them until 1815, when its independence was restored under the provisions of the Treaty of Vienna. (For the chief events in the subsequent political history of the city, see the article dealing with the State of Bremen.) The city was severely bombed by Allied aircraft during World War II. Pop. (1950) 444,549.

BREMER, FREDRIKA (1801–65), Swedish novelist, born in Tuorla, Finland, and privately educated at Arsta, Sweden, where her family resided after 1805. Her first work, *Sketches of Everyday Life* (1828), attracted little notice at the time, but *The H. Family* (1829) was an immediate success. *The President's Daughter* (1834), *Nina* (1835), and *The Home* (1839) were translated into English, and established her reputation in Great Britain and the United States. Journeys in Europe, Palestine, and the United States furnished materials for her *Homes of the New World* (1853) and *Life in the Old World* (1862). After her return to Sweden, she became active in philanthropic movements, and her later novels deal with such contemporary social issues as the education and emancipation of women. Fredrika Bremer's *Life and Letters* (1868) was edited by her sister.

BREMERHAVEN, seaport of the State of Bremen, West Germany, situated at the junction of the Weser and Geeste rivers, 10 miles from the North Sea and about 38 miles N.N.E. of the city of Bremen. Together with the adjoining town of Wesermünde it forms an exclave of Bremen State. The port has a good harbor and many docks. Shipbuilding, shipping, and fishing are the chief industries. A large percentage of German foreign trade moves through Bremerhaven, and following World War II the port was the shipping terminal for American occupation forces in Germany. Founded in 1827, Bremerhaven was opened to trade in 1830. Pop. (1950) 114,070.

BREMERTON, city of Kitsap Co., Wash., situated on Puget Sound, about 15 miles W. of Seattle. Shipbuilding is the principal industry. Lumbering, dairying, poultry raising, and the growing of fruits and vegetables are leading occupations in the surrounding region. The city is served by steamship lines and by ferries operating to various points on Puget Sound, and is the site of Puget Sound Navy Yard, founded in 1891. Bremerton was incorporated in 1901. Pop. (1950) 27,678.

BRENDAN, BRENAINN, or **BORANDON,** SAINT (484–577), Irish monk and missionary and the subject of a widespread medieval legend concerning a seven years' voyage to the Land of Paradise, a territory thought to lie beyond the Canaries, and indicated on maps up to the time of Columbus. St. Brendan founded a monastery at what is now Clonfert. His feast day is May 16.

BRENNAN, WILLIAM JOSEPH, JR. (1906–), American jurist, born in Newark, N.J., and educated at the University of Pennsylvania and at Harvard Law School. He was admitted to the New Jersey bar in 1931. From 1931 to 1942 he engaged in the private practice of law. During World War II Brennan served in the U.S. Army as a legal aide, specializing in industrial and labor problems. He was discharged with the rank of colonel. After the war he resumed private practice. Brennan was appointed a judge of the Superior Court of New Jersey in 1949. The following year he was promoted to the appellate division of the court. He was named an associate justice of the Supreme Court of New Jersey in 1952. In 1957, by nomination of President Dwight D. Eisenhower, he became an associate justice of the U.S. Supreme Court, filling the vacancy created by the retirement of Associate Justice Sherman Minton.

BRENNER, VICTOR DAVID (1871–1924), American sculptor and medalist, born of American parents in Shavly, Russia. After 1890 he worked in the United States as a die cutter for several years, and in 1898 went to Paris, where he studied under Louis Oscar Roty. Besides many medals, for which he received awards in Europe and the U.S., he designed the seal of the New York Public Library and of the Fine Arts Federation of New York, and the Lincoln one cent piece. He wrote *The Art of the Medal* (1910). Among his sculptures is the bust of Charles Eliot Norton (Fogg Museum, Harvard University).

BRENNER PASS, route extending for a distance of 59 m. through the Alps mountains, between Innsbruck, Austria, and Bressanone, Venezia Tridentina, Italy. It is named for the village of Brenner, site of an Italian customs station at the Austrian frontier. At Brenner it attains its highest elevation (4494 ft.). Brenner Pass is the lowest pass over the main

ranges of the Alps and the shortest overland route between central Germany and Italy. A railroad connecting the Austrian and Italian rail systems extends through the pass. Begun in 1864 and completed in 1867, the line passes through 22 tunnels and across 67 bridges. In use since remote antiquity, Brenner Pass has often figured prominently in the history of s. central Europe. It was the chief invasion route followed by the Germanic tribes that overran Italy in the 5th century. In later times the pass was frequently used by the Holy Roman emperors. The German fuehrer Adolph Hitler held several conferences with the Italian dictator Benito Mussolini in the village in 1940–41, during World War II. Allied aircraft heavily bombed the rail line during the war.

BRENNUS (fl. 4th cent. B.C.), semilegendary Gallic chieftain. In 390 B.C. he led an invasion of Italy, defeated a Roman army, and captured and sacked the city of Rome. According to legend the Roman garrison held out for six months in the Capitol. During the siege the defenders were warned against a surprise night attack by the cackling of geese sacred to the goddess Juno. Brennus finally accepted a Roman offer of a thousand pounds of gold to ransom the city. At the weighing of the gold, the Romans complained that the Gallic weights were fraudulent, whereupon Brennus threw his sword into the scale with the weights crying *Vae victis,* "Woe to the vanquished".

BRENTANO, CLEMENS (1778–1842), German writer, brother of Elizabeth von Arnim, born in Ehrenbreitstein, and educated at the universities of Halle and Jena. In 1818 he became a devout Catholic and, until 1824, lived a secluded life in the Dülmen monastery, near Münster. In later life he devoted his literary talents to propagating the Catholic faith. Brentano is notable in German literature as a romanticist whose work abounds in fantastic images and unusual expressions. With his brother-in-law Ludwig von Arnim, he edited a compilation of German folk songs *Des Knaben Wunderhorn* (1805–08). He was the author of *Satiren und Poetische Spiele* (1800); the plays *Ponce de Léon* (1804) and *Die Gründung Prags* (1815); numerous short stories, including the notable *Geschichte vom Braven Kasperl und dem Schönen Annerl* (1838); and the collection of romantic tales *Romanzen vom Rosenkranz* (published posthumously, 1852).

BRENTANO, FRANZ (1838–1917), German philospher, born in Marienberg, the nephew of Clemens and brother of Lujo Brentano (qq.v.). He was for a time a Catholic priest (1864–73). In 1872 he became professor of philosophy in Würzburg, and from 1874 to 1880 taught in Vienna. He left behind a large number of unpublished scientific writings. His works include *Psychologie des Aristoteles* (1867), *Psychologie vom Empirischen Standpunkte* (1874); *Untersuchungen zur Sinnespsychologie* (1907), and *Von der Klassification der Psychischen Phänomene* (1911).

BRENTANO, LUJO or LUDWIG JOSEPH (1844–1931), German political economist, born at Aschaffenburg, Bavaria. He studied at Dublin, and at four German universities. After attaining a post in the royal statistical seminary in Berlin, he went to England to study the condition of the working classes, and especially trade associations and unions. The outcome of this was his principal work, *Die Arbeitergilden der Gegenwart* (1871–72). From 1872 to 1891 he was professor of political theory successively in Breslau, Strasbourg, Vienna, and Leipzig, and from 1891 to 1914, when he retired, held that position at Munich. Brentano championed pacifism, and in 1927 was awarded the Nobel Peace Prize. His later writings included *Die Anfänge des Modernen Kapitalismus* (1916), *Arbeitslohn und Arbeitszeit nach dem Kriege* (1918), *Der Wirtschaftliche Mensch in der Geschichte* (1923), and *Konkrete Grundbedingungen der Volkswirtschaft* (1924).

BRENTFORD AND CHISWICK, municipal borough of Middlesex, England, and part of Greater London, situated on the Thames R., about 10 miles W. of London. Brewing, soapmaking, sawmilling, and truck gardening are the principal occupations. In 1016 English forces under King Edmund II (Ironside) defeated an army of invading Danes in and around the town. Royalist troops triumphed over a Parliamentarian force there in 1642, during the Great Rebellion. Pop. (1951 prelim.) 59,354.

BRESCIA (anc. *Brixia*), capital of the province of the same name, Lombardy, Italy, situated in a fertile plain at the foot of the Alps, 52 miles E. by N. of Milan. The city is an industrial center, with iron foundries and factories engaged in the manufacture of firearms, hardware, paper, silk, linen, and a variety of other products. Founded in remote antiquity by the Cenomani, a Celtic tribe, Brescia was seized by Rome in 225 B.C. In 15 B.C., during the reign of Emperor Augustus, the Romans established a colony there. After the collapse of the Roman Empire it was successively a possession of the Ostrogoths,

Lombards, French, Germans, Milanese, Venetians, Austrians, and Sardinians. In 1860 the city became part of the newly established kingdom of Italy. Points of interest include a Roman temple, dating from 73 A.D. and excavated in 1822. The temple now serves as a museum of Roman antiquities. Other noteworthy structures are the original cathedral, built during the 11th and 12th centuries; the present-day cathedral, completed in 1604; and Broletto Palace, a 12th-century edifice. In the 16th century Brescia was the center of a noted school of painters, including Il Moretto (Alessandro Bonvicino) and Giambattista Moroni; the Gallerio Marinengo in Brescia possesses many of the paintings of the Brescian school. Area of province, 1834 sq.m.; pop. (1936) 744,571. Pop. of city (1951) 143,533.

BRESHKOVSKY, CATHERINE (Russian, EKATERINA KONSTANTINOVA BRESHKO-BRESHKOVSKAYA) (1844–1934), Russian revolutionary leader, known as "the little grandmother of the Russian revolution", born near Vitebsk. At the age of 26 she left her wealthy and aristocratic family to join the followers of the anarchist Bakunin (q.v.) in Kiev. In 1874 she was imprisoned in St. Petersburg, now Leningrad, and in 1878 was exiled to Siberia. She returned to Russia after her release in 1896 and founded a political society, the Socialist Revolutionists, and in 1902 was one of the founders of the Socialist Revolutionary Party. Again threatened with imprisonment, she went to Switzerland (1900) and then the United States (1904–05). She returned to Russia to participate in the unsuccessful revolution of 1905, and was again imprisoned and banished to Siberia. The 1917 revolution brought about her return from Siberia and her enthusiastic welcome in Petrograd (Leningrad). Her role in Soviet councils terminated after the seizure of power by the Bolsheviks, whose principles she opposed. She was again compelled to flee Russia in 1919, and went to Czechoslovakia where she remained until her death.

BRESLAU. See WROCLAW.

BRESNAHAN, ROGER PHILIP (1879–1944), American baseball player and manager, born in Tralee, Kerry County, Ireland. He began his professional career as a catcher in the Ohio State League in 1896. In 1902 he became first-string catcher for the "Giants", the New York National League team. Traded to the St. Louis "Cardinals" in 1908, he caught for that team until 1913, when he joined the Chicago "Cubs" as catcher-manager. For several years after 1916 he owned, managed, and caught for the Toledo, Ohio, team. Bresnahan devised the shin guards now universally employed by catchers. One of baseball's greatest catchers, he played in 1410 major-league games; his lifetime batting average was .279. In 1945 he was elected to the National Baseball Hall of Fame.

BREST, seaport of the department of Finistère, France, situated at the mouth of the Penfeld R., on the N. side of the Bay of Brest, and 389 miles by rail W. of Paris. Two hills, on opposite sides of the Penfeld R., are the site of the main section of the city. On one of the heights is a citadel dating from the 12th century. Brest is the chief naval station of France and possesses an excellent harbor. Submarine pens, numerous piers, a naval school, and other naval installations occupy both banks of the river. Considerable waterborne commerce moves through the port. Timber, coal, iron, steel, gasoline, and wine are among the chief imports; leading exports include beer, potatoes, brandy, fruit, fish, and pyrites. The city has diversified industries, notably shipbuilding, fishing, brewing, and the manufacture of chemicals, boots and shoes, linen fabrics, candles, and flour.

Brest came into the possession of the duke of Brittany in 1240, belonged to England from 1342 to 1397, and passed to the kings of France in 1514, when Francis I married Claude, daughter of Anne, Duchess of Brittany. The city was first fortified, between 1680 and 1688, under the direction of Sebastien de Vauban, the noted French military engineer. Brest has frequently been subjected to attack by enemies of France. During World War I the city served as the main debarkation point in France for American troops. It was occupied by the Germans in June, 1940, during World War II, and was severely bombed by the Allies. American troops captured the city on Sept. 19, 1944. Pop. (1946) 74,991.

BREST or **BREST LITOVSK** (Pol. *Brześć nad Bugiem*), capital of the Region of Brest, Byelorussian Soviet Socialist Republic, U.S.S.R., situated at the confluence of the Bug and Muchawiec rivers, about 110 miles E. of Warsaw. It is a major railroad junction and a center of trade in leather, grain, lumber, flax, and hemp. Originally a Polish city, Brest was awarded (1795) to Russia in the third partition of Poland (q.v.). During World War I it was the center of severe fighting between Russian and Austro-German armies and was taken by the latter in August, 1915. In 1918 a treaty of peace ending hostilities

between the Soviet government and the Central Powers was signed there. (See BREST LITOVSK, TREATY OF). The city became part of the Republic of Poland, established in 1921, after World War I. In 1939, after the German invasion of Poland, Brest was occupied by the U.S.S.R. and incorporated into the Byelorussian S.S.R. The city was captured by the Germans in 1941, during World War II, and retaken by the Russians in 1944. Pop. (1939 est.) 55,374.

BREST LITOVSK, TREATY OF, the peace treaty, signed March 3, 1918, which put an end to World War I between the Central Powers (Germany, Austria, Turkey, and Bulgaria) and Russia. After the fall of the Russian Kerensky government (Nov. 6–7, 1917), the new Soviet government resolved to make peace with the Central Powers. An armistice with them was signed at Brest Litovsk on Dec. 17, 1917, and on Dec. 22, a formal Peace Conference was begun. Early in January the conference reached an impasse, and on Feb. 10 the Soviet government announced it could not conclude peace but would not renew warfare. The Central Powers, however, reopened hostilities and the Soviet government renewed negotiations and finally agreed to the drastic terms of the Central Powers. Russia gave up Finland, Poland, Estonia, Livonia, Courland, Lithuania, the Ukraine, and Bessarabia, all of which, though not annexed to the Central Powers, were dominated and economically exploited by them. Russia also ceded Ardahan, Kars, and Batum to Turkey. Under the conditions of the armistice between Germany and the Allied Powers, Nov. 11, 1918, Germany annulled the Treaty of Brest Litovsk, and on Nov. 13 the Soviet government did likewise.

BRETAGNE. See BRITTANY.

BRETHREN OF THE LORD, a phrase in the New Testament apparently referring to brothers and sisters of Jesus. The phrase occurs as stated in only one passage in the New Testament, 1 Cor. 9:5. However, the phrase "the Lord's brother" is applied to James (Gal. 1:19), and the general expression "his (my) brethren" is used several times in the Gospels. In view of these passages, which give the names of the brothers as James and Joses (Joseph) and Judas and Simon (Mark 6:3 and Matt. 13:55), there has existed, ever since the Patristic age, considerable controversy regarding the degree of consanguinity involved. Three views have obtained: (1) The Helvidian —first asserted by Tertullian (about 208 A.D.) and restated by Helvidius (about 380 A.D.)—that these brethren were later sons of Mary by Joseph, the reputed father of Jesus. (2) The Epiphanian—first appearing in the second century apocryphal books, the Gospel of Peter, and the Protevangelium of James, and chiefly supported by Epiphanius (about 370 A.D.)—that these brethren were sons of Joseph by a former marriage. (3) The Hieronymian—promulgated by Jerome (about 380 A.D.)—that these brethren were cousins of Jesus, being sons of Alpheus, the husband of a sister of Mary.

Of these views, the first repudiates the theory of the perpetual virginity of Mary. Modern scholars are about equally divided as to the validity of the first two views. The last view is generally rejected.

BRETHREN, PLYMOUTH. See PLYMOUTH BRETHREN.

BRÉTIGNY, PEACE OF, a treaty, concluded May 8, 1360, which brought to a temporary halt the Hundred Years' War (q.v.), which had been raging between France and England since 1338. It was signed in the French village of Brétigny, now in the department of Eure-et-Loir, 6 miles S.E. of Chartres. The treaty was made largely as a consequence of the English victory over the French at Poitiers, September 19, 1356, and the capture at that time of King John II of France, who was subsequently placed in captivity in England. By the terms of the treaty John was released on agreement to pay 3,000,000 gold écus (about $8,000,000); Charles, son of John and regent of France in his father's absence, acknowledged the sovereignty of King Edward III of England over Gascony, Guienne, Calais, and other territory in France; and Edward renounced his claims to the French throne. The treaty is sometimes known as the Peace of Calais, where it was ratified on October 24, 1360. In spite of the treaty and the state of exhaustion of both nations, the war between them broke out again in 1369.

BRETON, ANDRÉ (1896–), French poet and critic. His poetry was much influenced by the work of Stéphane Mallarmé and Arthur Rimbaud (qq.v.). Breton was a pioneer in the artistic and literary movement, Dadaism (q.v.), and, as editor of *La Révolution Surréaliste,* from 1924 on was one of the founders and chief exponents of Surrealism (q.v.). Selections from his poems written between 1923 and 1944 appeared in English translation under the title *Young Cherry Trees Secured Against Hares* (1946).

Art Institute of Chicago

Detail from "Song of the Lark," painting by Jules Adolphe Breton

BRETON, JULES ADOLPHE (1827–1906), French painter and author, born at Courrières (Pas-de-Calais). He studied under Devigne at Ghent, Wappers at Antwerp, and Drolling at Paris. Beginning as a historical painter, he soon turned to depicting the life and surroundings of the peasants of Artois and Brittany. Breton's art occupies a middle position between French classic tradition and the poetic realism of a Millet. Among his principal paintings are "Blessing the Grain" (1857) and "Return of the Gleaners" (1859), both in the Luxembourg, Paris; "Planting a Calvary" (1859, Lille); "Song of the Lark" (1885, Art Institute, Chicago); and "The Pardon of Kergoat" (1891, Metropolitan Museum, New York). He wrote poetry and prose, including *Les Champs et la Mer,* poems (1875); *Jeanne,* a poem (1876); *La Vie d'un Artiste* (1890); and *Un Peintre Paysan* (1895).

BRETON LANGUAGE AND LITERATURE. The Breton, the ancient language of Brittany (q.v.), often called Armorican to distinguish it from insular Breton, is one of the small Celtic tongues which have continued to be spoken languages down to the present time. Together with Welsh, the recently extinct Cornish, and the language spoken by the ancient Gauls, it forms the Cymric group of the Celtic languages. It is still the ordinary language of about 1,250,000 persons, of whom no fewer than 650,000 know that language alone.

Breton is most closely allied to Cornish and next to Welsh, but it surpasses both these tongues in the refinement of its grammatical forms and words. Most competent scholars consider it as having been carried across the channel from England in the settlements made in French Brittany during the 5th and 6th centuries by Celts taking refuge among their continental kinsmen from the Saxon invaders. Besides linguistic peculiarities, such as the tendency to introduce nasals, Breton is distinguished from Welsh and Cornish by the large number of French words that it has naturalized from the time of Anne de Bretagne to the present day. In modern Breton four distinct dialects are recognized, those of Léon, Tréguier, Cornouailles, and Vannes.

The Breton literature of the earliest period (since the 6th century) is grouped with the Bardic literature of the British Isles. Many of the oldest and most famous of the bards (as Gweznou, Taliesin, and Sulio) are thought to have belonged to Brittany; their spirited poetry, patriotic, historical, and erotic, probably influenced the work of the French trouvères of succeeding centuries.

During the 19th century there was a literary revival in Brittany. In 1827 the Bible was translated into Breton by Le Gonidec. In 1839 appeared the first edition of *Barzaz Breiz,* by de Villemarqué, a book which gave rise to a long discussion resembling, on a smaller scale, the controversy over Macpherson's *Ossian.* The *Barzaz Breiz* was finally discredited as a reproduction of Breton popular songs.

At the present time in Brittany, as in the other Celtic countries, an effort is being made to preserve the native language and to promote its use in literature.

BRETONS. See BRITTANY.

BRETTON, HENRY DE. See BRACTON.

BRETTON WOODS CONFERENCE, the popular name for the United Nations Mone-

tary and Financial Conference which took place from July 1 to 22, 1944, at Bretton Woods, a vacation resort in Coos County, New Hampshire, in the White Mountains. The conference was attended by representatives from 44 nations. Its principal result was the creation of an International Monetary Fund and an International Bank for Reconstruction and Development (qq.v.).

BRETTS AND SCOTS, LAWS OF THE, name given, in the thirteenth century, to a code of primitive law in use among the Celtic tribes in Scotland. The "Scots" were the Celtic people dwelling in the western districts north of the Forth and the Clyde; the "Bretts" were the British or Welsh inhabitants of the region lying south of the Forth and Clyde. This province was for some centuries an independent kingdom called Strathclyde. In 1305, King Edward I of England, who appeared then to have reduced all Scotland to his subjection, decreed "that the usages of the Scots and the Bretts be abolished, and no more used". Of the code which it proscribed only a fragment has been preserved.

The unique feature of the laws was the institution of the *cro,* which put a stated value on every man's life. A king was valued at 1000 cows, while his son or the son of an earl was only worth 150 cows. Persons of lower social rating were given values as low as 16 cows. In cases of murder the homicide was assessed the value of the man's life, which was paid his next of kin.

BREUER, Marcel Lajos (1902–), Hungarian-American architect, born in Pécs, Hungary. He attended the Bauhaus school of architecture in Weimar, Germany, in 1924, and was the director of the Bauhaus in Dessau from 1925 to 1928. From 1928 to 1937 he practiced architecture successively in various European countries, Morocco, and England. In 1937 he was appointed associate professor in the Architectural Department of Harvard University, and until 1942 conducted an architectural firm in Cambridge, Mass., with Walter Gropius (q.v.). Breuer designed hospitals, factories, private homes, and prefabricated houses, and pioneered in the design of tubular steel, aluminum, and plywood furniture. He is the author of *Sun and Shadow; the Philosophy of an Architect* (1956).

BREUGHEL. See Brueghel.

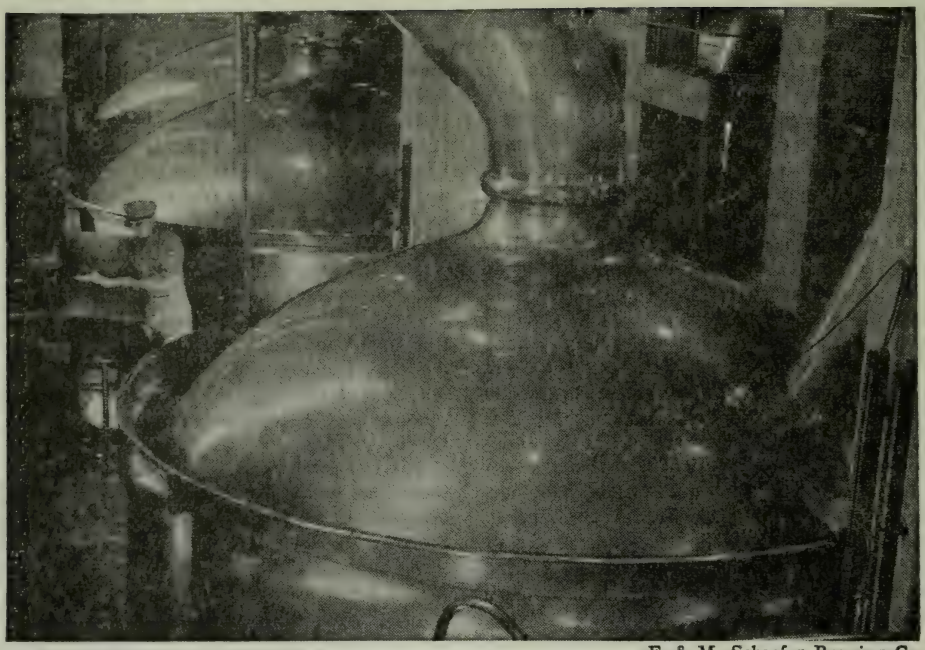
BREVIARY, the book, among Roman Catholics, which contains the "divine office", or the service for the canonical hours. From early Christian times the recitation of the Psalms of David formed a large part of the public and private devotion; it was developed in the West by the monks, whose life included frequent meeting for prayer, and still forms the nucleus of these offices. Around it grew up a system of hymns, prayers, antiphons, responses, and readings from Holy Scripture, which forms a varied and complicated service.

Before the sixteenth century there was an infinite number of local usages, nearly every diocese having its own breviary. The most ancient and liturgically important of the non-Roman breviaries are the Mozarabic, once general throughout Spain, and the Ambrosian, traditional in Milan from the days of St. Ambrose. Pope Pius V abolished all that could not show an antiquity of 200 years, and at the present day the Roman breviary is almost universally used.

There is a tendency in favor of shortening the office, whose recitation, even in private, occupies at least an hour and a half every day. So complicated has the system become that a sort of annual almanac, called *Ordo Recitandi Divini Officii,* is published in many countries, containing minute directions as to what is to be read. The need of simplification led Cardinal Quignon or Quiñones, a Spaniard, to publish a reformed breviary in 1535, which, while it was never widely used, gave the English reformers a number of hints for their simplified and condensed prayer book.

The canonical hours are seven: matins and lauds (forming practically one service), prime, terce, sext, none, vespers, and compline. Matins were supposed to be, and are in monasteries, sung in the night; the other offices are called the day hours, and are published in separate form, for convenience, under the title *Horæ Diurnæ.* Lauds and vespers are the most important of these services, containing the "evangelical canticles" (the *Benedictus* at lauds and the *Magnificat* at vespers) and being sung with more ritual solemnity. The names prime, terce, sext, and none refer to the times at which they were originally recited—the first, third, sixth, and ninth hours of the day. Compline (*completorium,* the completion of the cycle) was recited at bedtime.

Those who recite the office privately, however, do so at any convenient time. The daily recitation of the breviary is strictly obligatory on all clerics and all "choir" members of religious orders (as distinguished from lay brothers or sisters). The use of the breviary as a book of private devotion by laymen has become rare since the multiplication of devotional works of different kinds, but at present shows some tendency to increase; and it has



F. & M. Schaefer Brewing Co.

Brewing: copper kettles in which the wort is boiled

always been a common custom to sing vespers or compline, at least on Sundays, in parochial churches.

The contents of the breviary, after the general rubrics, tables, and calendar, fall into five parts: (1) The Psalter, or original arrangement of the Psalms and prayers for the days of the week. (2) The Proper of the Season, containing the service for Christmas, Easter, Pentecost, and the seasons dependent on them. (3) The Proper of Saints, for the numerous special feasts which recur on a fixed anniversary. (4) The Common of Saints, parts of the service which belong to classes of saints, as apostles, martyrs, and confessors. (5) Several minor services, including the office of the dead and the little office of the Blessed Virgin Mary.

BREVIARY OF ALARIC, an important collection of Roman laws, compiled by order of Alaric II, King of the Visigoths, in the first decade of the sixth century A.D. It corresponds historically to the code of laws promulgated by Theodoric, King of the Ostrogoths (*Edictum Theodorici*), the Salic Law (*Lex Salica*) and Ripuarian Law (*Lex Ripuaria*) of the Franks, and other similar codes of that period. The primitive conception of law, as of personal and not territorial application, compelled the barbarian invaders to administer two systems of law—one for their barbarian followers, and the other for the Roman inhabitants of the territory occupied by them.

The Breviary of Alaric II was a code designed for the Roman subjects of the invader and was almost exclusively Roman in character. It was made up of extensive abridgments of the Code and Novels of Theodosius, the Institutes of Gaius, and other authorities. A corresponding code promulgated by Alaric for his barbarian subjects, and containing their own native law, was known as the *Forum Judicum* and *Judicum Liber*. This was similar to other primitive codes, as the Anglo-Saxon laws and the ancient Brehon law of Ireland, although it reflected, more than these, the influence of Rome. The two codes together constitute the *Lex Visigothorum*.

BREWING, the process of making beer, ale, and similar cereal beverages which are fermented but not distilled. The raw materials of these beverages are water, hops, and barley, which may be supplemented by corn, rice, or sugar. The first step, preliminary to brewing, is the malting of the barley. This is followed by mashing, or digestion and extraction of the soluble elements of the grain with water. The liquid is then drawn off, cooked

with hops, fermented, and finally cellared for ripening.

Malting. The grain is first steeped in cold water for 45 to 72 hours, the water being drained off about once a day. After the final draining, the barley is taken from the steeping tanks and placed in slowly revolving drums or in shallow tanks equipped with plows. Here the soggy mass is stirred and aerated, and the grain begins to germinate, or sprout. In the process of germination, the grain produces several enzymes (q.v.), the most important of which is an amylase (q.v.), malt diastase, which has the property of changing starch into sugar. Germination is allowed to proceed for about six days; the sprouted barley, now called malt, is then kiln dried. Kilning checks germination and produces substances which impart an aromatic flavor to the beer. By varying the degree of heat, the malt can be toasted to any desired color from light tan to dark brown; the color of the beer is determined by the color of the malt.

Mashing. The first operation in brewing is the crushing of the malted grain by passing it between iron rollers. The grist is then mixed with warm water in large tubs until it forms a mash having the consistency of porridge; then the supplementary grains are added. If raw grain is used, it must undergo preliminary boiling; with prepared cereals, such as corn flakes, precooking is not required. The temperature of the mash is then raised in steps from 100° F. (38° C.) to 170° F. (77° C.), with sufficient time allowed at each step for the various enzymes to act. The finished mash is allowed to rest for a short time, and the spent malt settles to the bottom of the mash tub, forming a filter bed through which the liquor, now called *wort,* is drawn off. Hot water is run through the residue to rinse, or *sparge,* out the remaining wort from the spent grain. About 35 pounds of barley malt and 15 pounds of corn or rice are used for each 31-gallon barrel of beer.

Cooking. The wort is drawn off into copper kettles where it is boiled with 9 to 16 ounces of hops for each barrel. After boiling, the hops are screened out, and the wort is passed through a cooler and run into vats where fermentation takes place.

Fermentation is started by adding for each barrel of wort about one pound of a pure culture of yeast reserved from a previous brewing of the same kind of beer. Bottom-fermenting yeast (settling to the bottom) is used for lager beer, and top-fermenting yeast (rising to the top) is generally used for ale. Fermentation is allowed to progress for a number of days, the time depending upon the kind of beer brewed. The yeast is then skimmed off or allowed to settle, and the beer is drawn off for cellaring.

Cellaring. The beer is aged for 3 weeks to 3 months in storage vats, where it becomes clarified and where its flavor develops. When it is fully matured, a small amount of fresh wort or sugar is added, and the beer is placed in pressure tanks where final fermentation produces the carbon dioxide gas which gives the characteristic head, or foam. Finally, the beer is filtered and is sealed in pitch-lined kegs, or is bottled and pasteurized.

By-products. Spent malt remaining after mashing and sparging is rich in nutritive elements; it is sold as *brewers' grains* for cattle feed or fertilizer. Brewers' yeast, which is produced in the fermentation process in excess of brewing requirements, is a rich source of vitamins, especially those of the B complex. Carbon dioxide, also produced by fermentation, may be recovered and used in the manufacture of dry ice or carbonated beverages, or in fire extinguishers. See ALE; BEER; CARBON DIOXIDE; FERMENTATION; HOP.

BREWSTER, WILLIAM (1567–1644), one of the *Mayflower* pilgrims, born at Scrooby, England. He withdrew from the Established Church, and formed a society which met for worship at his house. With some friends, he was imprisoned on the eve of his escape to Holland. Obtaining his release with difficulty, and shorn of most of his means, Brewster made his way to Leiden, where he supported himself by teaching English. He sailed with the *Mayflower* in 1620, and acted as pastor to the church at Plymouth.

BRIAN BORU or (Gaelic) **BRIAN BORAIMHE** (926–1014), King of Ireland. From 976, when his brother Mathgamhain, King of Thomond and Munster, was murdered, until 978, he fought against the tribes of Munster, subjugating them and becoming their king. He subsequently defeated the Danes, brought other regions of Ireland under his control, and became ruler of the entire country (1002) by defeating Maelsechlainn, the chief king. In April, 1014, he led his army against the Danes at Clontarf, near Dublin, winning an overwhelming victory.

BRIANÇON (anc. *Brigantium*), a town in the department of Hautes-Alpes, France, situated on the Durance River, on a plateau about 4300 feet above sea level, and 51 miles N.E. of Gap by rail. Commanding the entrance into

Italy through the Col de Genèvre and other passes, Briançon is an important Alpine military post and has been strongly fortified by the French since 1722. The town is a health resort and has a large summer tourist trade. Its principal manufactures are silk, cotton, cutlery, and hosiery. Pop., about 6000.

BRIAND, ARISTIDE (1862–1932), French statesman, born at Nantes. He was premier of France for ten terms, beginning in 1909. Early in his career, Briand drafted the bill for the separation of the church and state in France. During World War I he was prime minister from Oct., 1915, to Mar., 1917, when he was succeeded by Alexandre Ribot. In 1922 he attended the Washington Disarmament Conference in the capacity of premier and minister of foreign affairs. In his latter years he carried out a policy of rapprochement with Germany that resulted in the Locarno treaties and gained him the Nobel Peace Prize in 1926.

During 1927 Briand played an important part in bringing about the Kellogg-Briand Pact (q.v.) to outlaw war. He was foreign minister in various cabinets. Briand was the sponsor of an economic union of Europe to be known as the United States of Europe.

BRIANSK. See BRYANSK.

BRIARD, breed of working dog, developed in France and having an ancestry which has been traced as far back as the 12th century. In modern times the Briard has been employed extensively in the herding of sheep and cattle and as a watchdog on small farms throughout France, particularly in the Brie agricultural region for which the breed is named. The Briard is a strong, handsome dog with a large head, a square, black nose, and bushy eyebrows which serve to protect its eyes in thick underbrush. Its coat, usually black, gray, or tawny in color, is long-haired and slightly wavy. The tail is well feathered and carried low. Adult males are from 23 to 27 inches high at the shoulder; females are a little smaller in size. A litter averages from 8 to 10 puppies. Affectionate and playful, the Briard is considered an excellent family dog, and makes a good companion for children.

BRIAREUS (also called Ægæon), in Greek mythology, the son of Uranus and Gæa, a monster who had a hundred hands and fifty heads. He fought for the gods against the Titans.

BRIBERY, in common and statutory law, designation applied to the act of offering, promising, giving, soliciting, or receiving money, goods, employment, or anything personally beneficial for the purpose of unlawfully influencing any person in the exercise of public duty. Specifically, bribery is the tendering of a reward to or the solicitation of a reward by a judicial, legislative, administrative, or military employee of government in exchange for official favors contrary to the public interest. The tenderer and the solicitor of bribes are equally culpable under the law, and are so considered in many States of the United States, even in the absence of actual consummation of the offense. Bribery as it relates to the corruption of jurors is usually designated as embracery. In the United States, bribery is defined in the statutory codes of the Federal government and most of the States as a felony, punishable in many States by imprisonment up to ten years. The bribery laws of a number of States, including New York, apply not only to acts involving public officials, but also to similar acts, involving an agent or employee in private business, which may affect the employer's enterprise. Bribery was long recognized as an offense in common law, particularly as it related to the conduct of the judiciary. The corruption of other public officials, however, was also a common-law offense, whether the bribery was employed to induce an officer to act or to refrain from acting in his official capacity. The act of offering a bribe, even though it was refused, constituted a common-law misdemeanor. See ELECTIONS; ELECTORAL REFORM.

BRICE, FANNY (1891–1951), real name Fanny Borach, American actress, born in New York City and educated in its grammar schools. She made her first stage appearance in Brooklyn, N. Y., in the play *A Royal Slave.* After a career as an actress in burlesque and vaudeville, she appeared in the musical revue *Ziegfeld's Follies* (1910); she played important roles in nine subsequent editions of the revue, her last appearance being in 1936. Among other theatrical productions in which she played leading roles were *Nobody Home* (1916), *Why Worry?* (1918), *Music Box Revue* (1924), *Fanny* (1926), and *Crazy Quilt* (1931). In 1930 she originated the part of a comic child character, "Baby Snooks," in radio, and played the role with success for many years.

BRICK, name given to any baked, rectangular, prismatic mass of clay (or clayey substance) used for building purposes. Most commercial brick today is baked or "burned" in a kiln, but in some parts of southwestern U.S., sun-dried adobe bricks are in use. Sun-

dried brick was probably the ancestor of all brick, and was employed in antiquity by the Egyptians, Babylonians, and Assyrians. The Babylonians, however, used the more durable baked brick to face or bind walls of sun-dried brick. Most of the great buildings of Rome were built of baked brick, and the Romans introduced the art of brick construction into Europe. Adobe brick was probably brought to Spain by the Moors, and to the new world by the Spaniards.

The modern U.S. building brick measures 2¼″ x 3¾″ x 8″, slightly smaller than the standard English brick. It is produced from ground clay or shale in machines that either mold complete bricks or that cut off an extruded section of stiff clay to make the individual brick. The latest type of kiln is in the form of a tunnel through which the bricks move continuously on cars. These kilns, sometimes as much as 400 ft. long, can bake over 50,000 bricks a day.

Many kinds of special-purpose bricks are made, such as paving bricks for streets, textured bricks for decorative purposes, and glazed bricks which are given a ceramic glaze after burning. For the construction of fireplaces, ovens, and furnaces, firebrick is used.

BRICKER, John William (1893–), U.S. Senator, born in Pleasant Township, Ohio. He graduated from Ohio State University in 1916. Following service as a lieutenant in the U.S. Army during World War I, he enrolled in the Ohio State University law school and, in 1920, received a law degree. He became assistant attorney general of Ohio in 1923, serving until 1927. He was a member of the Ohio Public Utilities Commission (1929–32) and attorney general of the State (1933–37). Bricker was defeated as Republican candidate for governor of Ohio in 1936, but was nominated again in 1938 and elected. He was re-elected in 1940 and 1942. In 1944 the national convention of the Republican Party nominated him for the vice-presidency, but he was defeated in the ensuing election. He was elected to the U.S. Senate from Ohio in 1946, and re-elected in 1952.

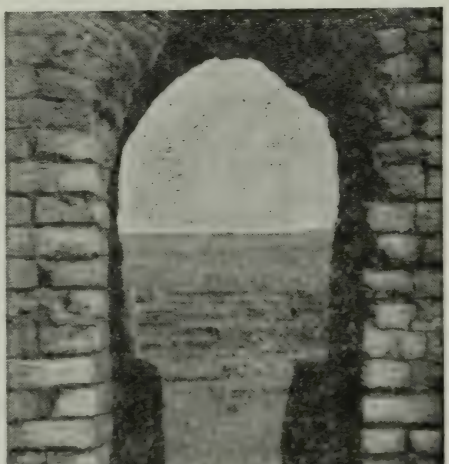
BRICKFIELDERS, a strong, hot wind of Australia blowing from the N., in November, December, and January. Under its influence the temperature at Sydney has been known to rise as high as 107° F. in central Australia still higher readings have been registered, a shade temperature of 131° having been recorded.

BRIDE, Saint. See Brigid, Saint.

BRIDEWELL, a district of London, England, between the Thames R. and Fleet Street. It was named after the well on or near Fleet Street, dedicated to the 5th-century Irish saint St. Bride or St. Brigid of Kildare. King Henry VIII erected a palace in the district, where in 1525 he entertained the Holy Roman Emperor Charles V. Edward VI gave the palace to the City of London in 1553 to be used as a house of correction for vagrants, rioters, and prostitutes. It later became a prison for all kinds of malefactors. Similar jails in England and some in the United States were often called bridewells.

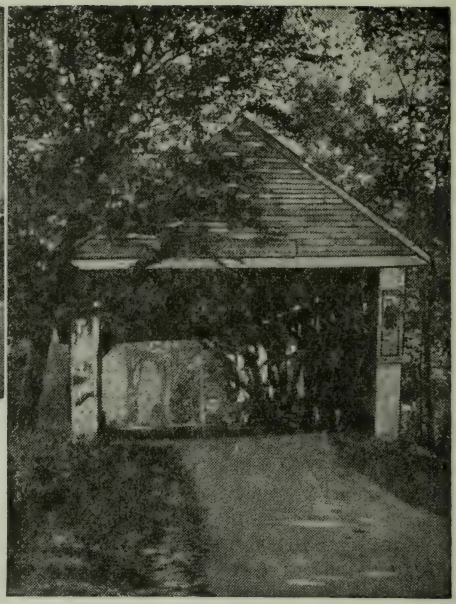
BRIDGE, a structure over a body of water, a road, or a valley, to connect opposite sides and provide passage across. Generally a bridge carries a pathway, road, or railroad, but it may carry a canal or water conduit, an electrical or mechanical power-transmission line, or a conveyor. A bridge extending over dry land or crossing a wide valley containing a relatively small stream is usually called a *viaduct*, but this term is not specific. A bridge with width greater than its span, or, in railway or highway bridges, of span less than 8 feet, is called a *culvert*.

The earliest bridges were probably formed by one or more logs laid across a brook, resting on the two banks, or by a footpath laid on cables stretched across a narrow val-



University Museum, Philadelphia

Ancient Sumerian brick doorway standing in the district of Ur, Babylonia



Republic Pictures; Maine Development Comm.

EARLY TYPES OF BRIDGE IN USE TODAY

Above: Arabs crossing primitive footbridge spanning a depression in the desert.
Right: Typical early New England covered bridge near South Andover, Maine.

ley. Such bridges are still employed, especially by primitive peoples. The single-span bridge is an outgrowth of these elementary forms. The stepping-stone crossing, improved by laying logs to connect the stones, is the prototype of the multiple-span bridge. The driving of wooden piles into a river bottom to form bridge supports enabled the log or beam structure to span wider streams, and such *trestle* bridges are still widely used to cross valleys or streams where passage for boats need not be provided. Use of stone piers as intermediate supports for carrying wooden members marked another advance in the construction of wooden-beam bridges. The use of boats for the same purpose produces the pontoon bridge. Wooden-beam bridges appear to have been the only type known to the ancients (except the ancient Chinese who built stone-arch bridges) until the Roman age.

Roman bridges generally consisted of a level road supported on one or more semicircular arches. The Ponte de Rotto, or Senators' Bridge, erected by Caius Flavius in 127 B.C., is perhaps the first instance in the West of the application of the arch to bridge design. One of the remarkable bridges of antiquity was a wooden-arch bridge built in 103 A.D. by Trajan across the Danube near Warkel, in Hungary. It was 4500 feet long and 60 feet wide, and contained 20 arches, each having a span of 170 feet; the remaining 1100 feet was taken up by the width of the piers themselves. Semicircular arches were succeeded by pointed arches, generally of small span. Modern arches are often segmental or semielliptical, forms which afford wide span and free waterway with moderate elevation. The bridge across the Tweed at Kelso, Scotland, opened in 1803, was an important semielliptical-arch bridge designed by John Rennie. Rennie also designed the Waterloo Bridge, across the Thames at London, which carries a level, 42-foot roadway on nine semielliptical arches, each with a 120-foot span.

A beam, or girder, bridge is limited in span by the strength of its girders. This limitation is largely overcome by assembling several girders to form a truss. Leonardo da Vinci sketched truss bridges, and Andrea Palladio probably built several. Two truss bridges were built in Switzerland about 1760. However, truss-bridge construction did not develop on a large scale until the railroad-building era after 1840. In the U.S. the use of wooden trusses with iron tie rods led to a combination cast- and wrought-iron construction about 1850 and, later, to steel trusses.

Suspension bridges, with chains laid over towers on the banks, supporting a level roadway from the chains by hanger rods, were built about 1800 in the U.S., and about 20 years later in England. In 1816 the first wire-cable suspension bridge was built, across the Schuylkill R. at Philadelphia.

MODERN BRIDGES. In construction of large

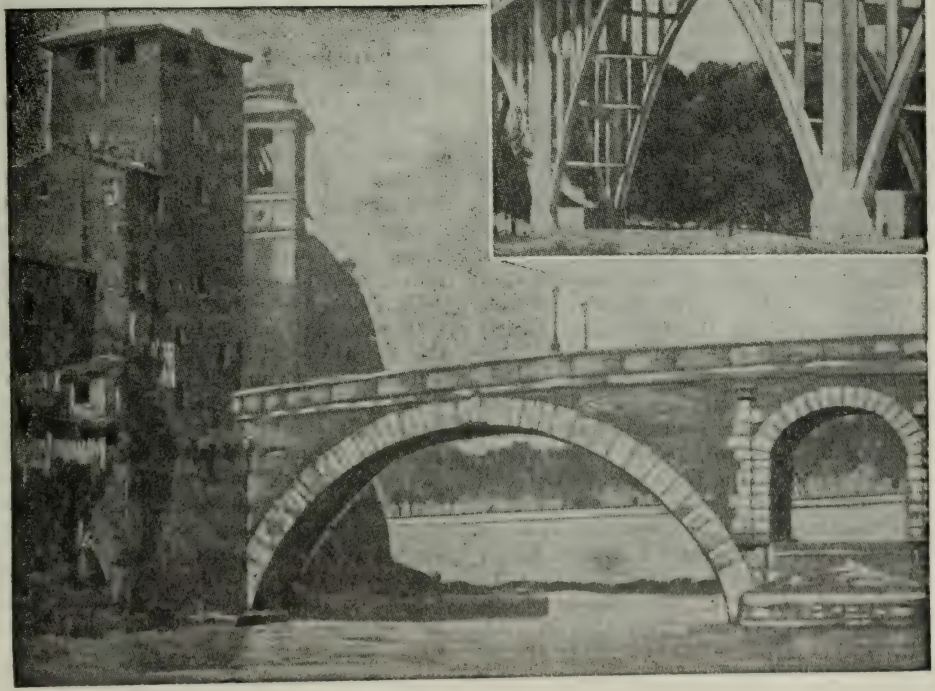
bridges of modern times, the principles chiefly employed are those of the cantilever, arch (qq.v.), truss, pontoon, and suspension bridge. Where provisions must be made for the passage of water traffic and it is impracticable to build the bridge high enough for complete clearance, a movable span is incorporated in the bridge. Notable examples of each type of bridge are listed below.

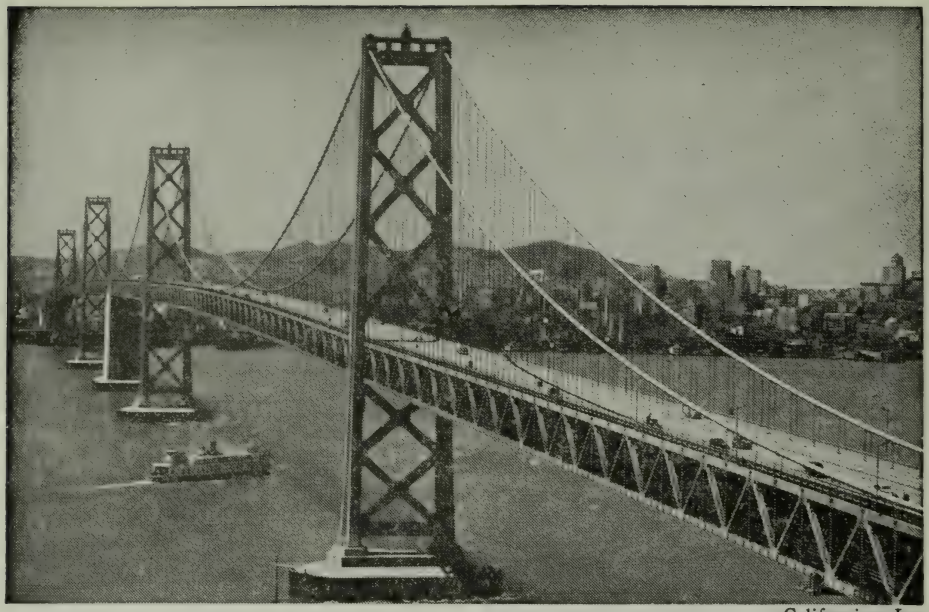
Canadian Pacific Railway

Above: Quebec Bridge, a cantilever type. Right: Modern arch bridge, of same type as the ancient Roman arch bridge shown below.

Cantilever Bridges. The cantilever bridge is characterized by spans which are supported not at the ends but rather toward the center of the girder or truss. The Forth Bridge, a steel railroad bridge in Scotland with two main spans of 1710 feet each, was erected (1882–90) by Sir John Fowler and Sir Benjamin Baker. Its total length is over a mile. The Quebec Bridge across the St. Lawrence R., completed in 1917, has a main span of 1800 feet; it carries a double-track railroad and a roadway. The Carquinez Strait Bridge, near San Francisco, was completed in 1927; it has two spans of 1100 feet each and anchor spans of 500 feet, and was designed to provide for earthquake resistance. The Howrah Bridge over the Hooghly R. at Calcutta, Indian, with a main span of 1500 feet, was opened in 1943.

Suspension Bridges. An 821-foot railroad suspension bridge was designed and constructed by John A. Roebling (q.v.) over the Niagara R., two and one half miles below the falls; it was constructed in 1852–55 and torn





Californians Inc.

SUSPENSION BRIDGE: *West Bay crossing of the Transbay Bridge in San Francisco, California.*

down in 1896–97. The Brooklyn Bridge across the East River in New York City, also designed by Roebling, was opened in 1883. It was far larger than any previous suspension bridge, having a central span of 1595 feet, and a total length, including side spans and approaches, of 5989 feet. The towers are of masonry, 276 feet high, and clearance at the center of the span in 135 feet. The George Washington Bridge (q.v.) between New York City and Fort Lee, N.J., carries eight lanes of highway traffic and two footways, and has capacity for the addition of four tracks of railway. The Golden Gate Bridge at San Francisco, opened in 1937, has a center span of 4200 feet (the world's largest) and side spans of 1125 feet. Its towers are 746 feet high, and it has a channel clearance of 220 feet.

Steel-Arch Bridges. The first important steel-arch bridge was built across the Mississippi at St. Louis by James B. Eads, and opened in 1874. The three arches span 502, 520, and 502 feet. The single steel arch across the Niagara Gorge, just below the falls, was 840 feet long, and was the longest in the world from its opening in 1899 until the completion of the Hell Gate Bridge across the East River in New York City in 1917. The Hell Gate Bridge was designed by Gustav Lindenthal, and has a span of 1017 feet. This span was exceeded by the Sydney Harbor Bridge, New South Wales, Australia, with a span of 1650 feet, and by the Bayonne Bridge from Bayonne, N.J., to Staten Island, N.Y., with a span of 1675 feet and a total length of 8100 feet, both completed in 1931.

Concrete-Arch Bridges. Soon after the start of the 20th century, the development of reinforced concrete brought about great progress in concrete-arch bridge construction. Notable examples of long-span concrete-arch bridges are found in France and include the Pierre du Vauvray Bridge over the Seine near Ande, with a span of 432 feet; the Pont de la Caille, near Cruseilles, with a 458-foot span; and the Plougastel-Brest Bridge across the Elorn R., with three 612-foot arches. The Esla bridge in Spain, with a 645-foot span (the world's longest), was completed in 1940. In the U.S. the Cappelen Memorial Bridge at Minneapolis has a central span of 400 feet. Multiple concrete-arch construction has been used, particularly in the U.S., for viaducts. The Tunkhannock (Pa.) railway viaduct is 2375 feet long and consists of ten 180-foot arches and two 100-foot arches. The Columbia (Pa.) highway viaduct is 7400 feet long, with 28 concrete arches of 185-foot span.

Philip Gendreau, N.Y.

Top: The 16th-century Rialto Bridge, a well-known landmark of the city of Venice, Italy.
Bottom: The famous Ponte Vecchio, Florence, Italy, which is lined with goldsmith's shops.

Stone-Arch Bridges. The development of railroads caused a revival of semicircular-arch construction for attainment of maximum strength, and cut stone is used in certain localities where low costs make its use economical. The Ballochmyle stone viaduct which crosses the Ayr R. has a semicircular arch of 180-foot span. The Congleton stone viaduct in Cheshire, England, is 106 feet high and 3078 feet long. A 12,000-foot viaduct of 222 arches over the Laguna Veneta connects Venice with the mainland of Italy. A stone-arch bridge with a main span of 138 feet was opened in 1930 on the Canfranc Railway as a trans-Pyrenean link between France and Spain. The 1170-foot Cenarbe Viaduct on the same line is also constructed of cut stone.

Steel-Truss Bridges. Steel-truss construction has been much used in bridge building because of its economy; it has the disadvantage, however, of a relatively shorter life. Modern developments have increased the length of span attainable, and continuous trusses are increasingly employed. A notable example of this type is Lindenthal's Sciotoville Bridge over the Ohio R., with a truss 1550 feet long in two spans of 775 feet each.

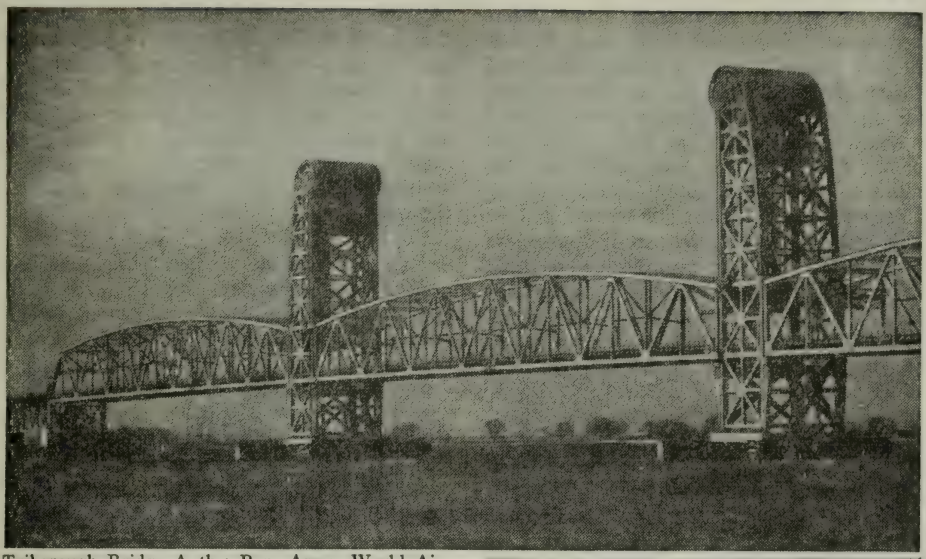
Pontoon Bridges. Permanent floating bridges, as distinct from temporary military structure, have been used where special local conditions prevail. The floating bridge across the Hooghly R. at Calcutta, India, is 1530 feet long. The roadway is supported 27 feet above water on 14 pairs of iron pontoons, each 160 feet long with 10-foot beam. A concrete-pontoon bridge more than a mile long carries a highway across Lake Washington, near Seattle. It consists of 25 floating sections bolted together and anchored in place. A telescoping floating span can be opened to permit the passage of large ships.

Movable Bridges. In addition to sections of pontoon bridges, movable spans may be bascule, swing, or vertical lift, dependent upon local requirements. The earliest form of the *bascule* bridge was one flap of framed timber to cross the moat of a castle, and drawn up by chains from the inside. This type of bridge, with one or two spans hinged and counterweighted so as to turn up, is favored for narrow waterways where traffic is heavy. The Tower Bridge across the Thames R. at London is the most famous example of this type. In the U.S., a double-deck bascule bridge crossing the Chicago R. has a span of 268 feet, and a single span at Lorain, Ohio, completed in 1940, has a length of 333 feet. The *swing bridge* has a movable span mounted on a pivot or turntable at its center. The longest span of this type, 532 feet over-all, is in a railway and highway bridge crossing the Mississippi R. at Fort Madison, Iowa, completed in 1927.

Vertical-lift bridges are used for long spans where full channel width and high clearance are necessary. The longest vertical-lift span is in the Marine Parkway Bridge connecting Brooklyn and the Rockaways in New York City, completed in 1937. It is 540 feet long, and has a clearance of 55 feet when closed and 150 feet when raised. Another remarkable bridge of the vertical-lift type crosses the Arkansas R. at Pine Bluff, Ark. It has six channel spans, each 239 feet long, any one of which may be used as a lift span by attaching the lift towers to the adjoining spans. This arrangement is necessary because of the liability of the main channel to shift.

Combination Bridges. In recent years several long bridges have been built incorporating different types of bridge construction. The most important of these are the Transbay Bridge at San Francisco and the Triborough Bridge in New York City. The Transbay Bridge, with approaches, is about 7½ miles long. It consists of an East Bay crossing, containing a 1400-foot cantilever span; and a West Bay crossing, containing two 2310-foot suspension spans. The two crossings are connected at Yerba Buena Island by a 500-foot double-deck tunnel and an 800-foot viaduct. The Triborough Bridge consists of bridges from the boroughs of Queens, Manhattan, and the Bronx, meeting over Randall's Island. It is about 3½ miles long and includes: over Bronx Kills, 7 truss spans totaling 1600 feet over-all length; over the Harlem River, 3 truss spans totaling 770 feet and a 310-foot vertical-lift span; over Randall's and Ward's Islands and Little Hell Gate, a 2¼ mile viaduct; and over Hell Gate, a suspension bridge with a 1380-foot central span and two 705-foot side spans.

Bridge Disasters. Collapse of bridges from accidental causes has been relatively rare, because of the high safety factor employed in their construction. Bridges can, however, be destroyed by vibration or excessive overloading. In 1850 a suspension bridge at Angers, France, collapsed because of the vibration induced by a body of 500 troops marching across it in step. The Tacoma Narrows Bridge at Puget Sound, Wash.,



Triborough Bridge Auth.; Pan. Amer. World Air.

MOVABLE BRIDGES

Above: Marine Parkway vertical-lift bridge in New York City, longest span of its kind. Right: World-famous bascule-type bridge, the Tower Bridge in London.

collapsed in 1940, only four months after its completion. The collapse was caused by a wind of 40 miles per hour which induced a twisting wave motion 28 feet high. At Sault Ste. Marie, Mich., a 336-foot double-leaf bascule span, the longest in the world, collapsed under the weight of a heavy locomotive in 1941, after 26 years of service.

BRIDGE, a card game played by four persons with a deck of 52 cards. Two of the players are "partners" competing against the other two. The term "bridge" alone is generally used today as an abbreviation for contract bridge, but more accurately it applies only to a variety of whist (q.v.) also known as bridge whist. This game became popular in England in the 1890's, and by 1900 had generally displaced the old game of whist.

In all forms of bridge, thirteen cards are dealt to each player. One of the players declares which of the four suits shall be "trump" (making the 13 cards of that suit higher in rank than the other 39 cards) or declares that there shall be "no trump", the method of declaration varying with the form of bridge. The player to the left of the declarer then "leads" one of his cards. Each of the others in turn plays a card; he must play a card of the suit led if he has any. The four cards constitute a "trick", which is won by the person playing the highest card of the suit led, or the highest trump if any trump has been played. The winner of the first trick leads the first card of the second trick, and so on for the remainder of the thirteen tricks. The scoring depends primarily on the number of tricks won by each side, and is different for the different forms of bridge.

AUCTION BRIDGE. In this form of bridge the players bid against one another for the right to declare the trump suit; each bid is an undertaking to win the specified number of tricks, and the winner of the auction is penalized if he does not make his bid. Auction bridge was developed in the early 1900's and by 1910 had almost completely displaced bridge whist.

Scoring. Penalty points and bonus points are scored "above the line", that is, not counted toward "game"; points are scored "below the line" only by the side winning the auction, and only if they make at least as many tricks as they bid. There is no score for the first six tricks; each additional trick counts 6 points if the trump suit is clubs, 7 if diamonds, 8 if hearts, 9 if spades, and 10 if there are no trumps. A total of 30 or more points below the line completes a "game"; the first side to win two games completes the "rubber" and gets a bonus of 250 points. At the conclusion of each rubber the scores are totaled without distinction between points below or above the line.

Penalties for failure to make a contract, which are awarded to the defending side as bonuses, amount to 50 points for each undertrick. If the contract has been "doubled" by the defenders, the penalty is 100 points for each undertrick; if "redoubled" by the bidding side, 200 points; re-redoubling is not permitted. If a doubled contract has been made, the side which made the bid scores double the trick value below the line, plus a bonus of 50 points for making the bid, plus an additional bonus of 50 points each for any overtricks. Corresponding redoubled scores are: four times trick value; 100 points for contract; and 100 points for each overtrick.

Bonuses are given for the holding of "honors", the five highest cards of the trump suit, or the four aces if there are no trumps. If one side holds 3 honors it scores 30 points; 4 honors, 40 points; 5 honors, 50 points. 4 trump honors in one hand count 80 points, 4 in one hand and one in partner's hand count 90 points, and all the honors in one hand count 100 points. Bonuses are also awarded for "slams": 50 points for a small slam, for taking 12 of the 13 tricks; 100 points for a grand slam, for taking all 13 tricks.

Contract Bridge. In this form of bridge the scoring places an emphasis on skillful bidding. The bidding and play in contract are identical with those in auction bridge (see above), but the techniques are different because of the difference in scoring. The bonuses that are awarded for rubber or for slams provide a constant spur toward bidding the full value of the hands as dealt, while the penalties for failure to make the bid (the highest bid becomes the "contract"), especially if doubled, are so severe as to evoke extreme caution against overbidding. As a result, expert bridge players have developed bidding "systems" so precise that they rarely fail to bid a game or slam which can be easily made, and almost never bid to a contract which they fail to make by more than two tricks, except where a larger loss is deliberately incurred to prevent the opponents from scoring an even greater number of points at a contract of their own choosing.

Contract bridge was developed in 1925, and by 1930 had almost completely displaced auction bridge. Its popularity has become so great that thousands of professional bridge experts engage in teaching, writing books and articles, and running tournaments.

Scoring. Only those tricks bid and made are scored below the line; overtricks are scored as bonuses. The first six tricks are not counted; each additional trick in clubs or diamonds counts 20 points; in hearts or spades 30 points; and in no trumps 40 points for the seventh trick and 30 points for each additional trick.

100 points below the line are required for game. A side is "non-vulnerable" at the beginning of each rubber, and becomes "vulnerable" after making one game. The first side to make two games collects a rubber bonus of 700 points for a two-game rubber or 500 points for a three-game rubber.

Honor bonuses are given only for honors all in one hand. Four suit honors count 100 points; five suit honors, or four aces in a no-trump contract, count 150 points. Bonuses for slams are given only for slams bid and made. A small slam yields 500 points if the bidding side is nonvulnerable, 750 points if vulnerable. The corresponding bonuses for grand slams are 1000 and 1500 points.

Redoubled penalties and bonuses are in all cases twice the doubled values. Penalties for undertricks are scored as bonuses by the defending side. An additional bonus of 50 points is awarded for making any doubled or redoubled contract.

Duplicate Bridge. This game is a variety of contract bridge, auction bridge, bridge whist, or whist, in which the factor of chance as affecting the final score is greatly decreased and the factor of skill is correspondingly enhanced. Duplicate bridge is especially popular for team games. Match-point duplicate is virtually the only game now used in championship bridge matches.

Duplicate bridge is played by about 20 to 40 players, divided into pairs. Each pair competes against all (or in some duplicate tour-

naments against half) of the other pairs. The cards are all dealt out before the tournament begins, and placed in pockets in separate "boards" on each table. The dealer, and, in duplicate contract, the vulnerability conditions, are marked on the board. The bidding and play of duplicate bridge are similar to those of ordinary, or "rubber", bridge, except that the cards are not gathered together at the end of each trick, but are placed in front of each player, and at the end of the hand are placed back in the board. The board is then passed on to the next table, and the same cards are replayed by four different players. A traveling score sheet goes with each board. Between hands the players move from table to table in accordance with a prearranged plan, so that each pair plays against as many other pairs as possible; at the same time, the boards are moved in such a way that the same pair never plays cards in the same board more than once.

Scoring of Duplicate Contract. The scoring of points is similar to that of rubber bridge except that no bonus is given for honors, and there are no rubbers. A bonus of 50 points is given for a "part score" (any score below the line less than game), and bonuses of 300 and 500 points for nonvulnerable and vulnerable games respectively. These point scores, however, are used only indirectly to calculate the final score, the tournament being scored on a *match-point* basis: on each board played, each team receives one match point for every other team which won a smaller score for that board, ½ match point for every team which received the same score. A team is scored only against other teams which played the identical cards. Thus, the holding of good or poor cards can have no effect on the final score. The winner of the tournament is the team holding the highest number of match points.

BRIDGEBUILDING BROTHERHOOD (Lat. *Fratres Pontifices*), a religious fraternity formed in the south of France in the latter half of the twelfth century, to build bridges and keep ferries. According to tradition, a shepherd boy, Bénézet, received a revelation that he must build a bridge across the Rhone at Avignon. Accordingly he went to the bishop and told his story, but was turned away. The provost, however, aided him, and work was begun in 1177. The bridge was not completed until 1185, and Bénézet, dying in the meantime, was buried in the chapel in one of the columns of the bridge. He was afterward canonized. Either the fame of St. Bénézet, or compassion for persons who were forced to pay large tolls, led to the founding of a brotherhood for the purpose of carrying on the work of bridgebuilding, and in 1189 Pope Clement III sanctioned the fraternity. Similar brotherhoods were formed in other parts of France and in the north of Italy.

BRIDGE OF SIGHS, narrow bridge connecting the Doge's Palace, in Venice, Italy, with the prison known as Carceri Prigioni. Constructed (about 1595–1605) under the supervision of the Italian architect Antonio Contino, the bridge is several stories high and spans the Rio della Paglia, a canal. Its name alludes to the behavior of convicts who were led across it after being sentenced in the ducal palace. A reference to the bridge occurs in the opening lines of Canto IV of *Childe Harolde,* by the English poet George Gordon, Lord Byron. The name "Bridge of Sighs" was also applied to the enclosed ramp over which prisoners on trial were brought to and from the former New York City Criminal Courts Building and the adjoining prison, called the Tombs.

BRIDGEPORT, county seat and port of entry of Fairfield Co., Conn., and third-largest city in population in the State. It is situated on Long Island Sound at the mouth of the Pequonnock R., 17 miles S.W. of New Haven and about 56 miles N.E. of New York City. Bridgeport is the chief manufacturing center of Connecticut and one of the foremost commercial and industrial centers of New England. The site of the city, about 18 sq.m. in area, occupies generally level ground adjoining Long Island Sound. Bridgeport harbor, formed by the estuary of the Pequonnock, is accessible to ocean-going vessels. Most of the raw materials required by the city's industrial enterprises are delivered by waterborne carriers. The city is served also by a trunk-line railway and by a network of bus and truck lines. Manufacturing is highly diversified in Bridgeport. Among the leading products are airplanes, sewing machines, firearms and ammunition, machine tools, brass and steel products, marine engines and cables, phonograph records, radios, textiles, clothing, and pharmaceuticals.

The city has many outstanding points of interest. One of its noteworthy edifices is the United Congregational Church, a splendid example of early-19th-century American ecclesiastical architecture. Other notable buildings are the City Hall, the United States Post Office, the Public Library, and the County Courthouse. The municipal park system pro-

vides a large variety of recreational facilities, including bathing beaches, golf courses, and picnic areas. Among the best-known units of the system are Seaside Park (210 acres), adjacent to Long Island Sound; Beardsley Park (234 acres), a wooded area containing a lake and the municipal zoo; and Fairchild Wheeler Park (410 acres). The University of Bridgeport, a coeducational school of higher education chartered in 1947, and the Bridgeport State Trade School are located in the city.

Established in 1639, Bridgeport was known originally as Pequonnock, after the local Indian tribe of that name. In 1694 the name was changed to Fairfield Village. Fairfield Village became known as Stratfield in 1701. The nearby village of Newfield was incorporated as the borough of Bridgeport in 1800, and in 1821 the borough merged with Stratfield to form the town of Bridgeport. In 1836 Bridgeport was chartered as a city. It became the seat of Fairfield County in 1853. During this period Bridgeport was an important seaport, with a flourishing whaling industry. The city's development as a manufacturing center began during the American Civil War, when large quantities of firearms, munitions, and other military equipment were manufactured there. Elias Howe, Jr., inventor of the sewing machine, established a sewing-machine plant in Bridgeport in 1863. In the postwar period scores of additional factories, especially plants engaged in the manufacture of brass products, were established in the city. The industrial growth of Bridgeport was greatly accelerated during World War I, and in World War II the city ranked as one of the major munitions-producing centers of the country. Pop. (1950) 158,709.

BRIDGER, James (1804–81), American trader, explorer, and scout, born in Richmond, Va., and known as "the Daniel Boone of the Rockies". An associate of the American fur trader William Henry Ashley, he made numerous trapping and hunting expeditions in the mountainous areas of Montana, Idaho, Wyoming, Utah, and the Dakotas. In 1825, during one of these journeys, he explored Great Salt Lake, until then known only to the Indians. He subsequently visited the region now known as Yellowstone National Park. Until his descriptions of the geysers and other natural features of the region were verified, they were generally characterized in the West as "Jim Bridger's lies". He served as a guide on several Western exploring expeditions, including the one (1832–35) conducted by the American army officer Benjamin Bonneville. In 1843 he founded Fort Bridger, Wyo. (pop., about 100), and in 1856 he discovered Bridger's Pass, in central Wyoming.

BRIDGES, Robert Seymour (1844–1930), English poet, born at Walmer and educated at Eton and at Corpus Christi College, Oxford. He practiced medicine until 1882, after which time he devoted himself entirely to the study of music and poetic form, and to the writing of poetry. Bridges was an experimenter in prosody, noted for his introduction of new rhythms and forms into English verse. Among his poetic works are *Prometheus, the Fire-Giver* (1883), *Eros and Psyche* (1885), *October and Other Poems* (1920), and *The Testament of Beauty* (1929), generally considered his masterpiece. He also wrote eight poetic plays (1885–94), and the prose works *On Prosody of Paradise Regained and Samson Agonistes* (1889), *Milton's Prosody* (1893), and *John Keats, a Critical Study* (1895). In 1913 Prime Minister Herbert Asquith appointed Bridges poet laureate.

BRIDGET, BRIGIT, or **BIRGITTA,** Saint (1303?–73), Swedish Roman Catholic saint, born at Finstad, in Upland, of noble parentage. At the age of fourteen she married Ulf Gudmarson, by whom she had eight children, one of whom was St. Catherine of Sweden. For some years she supervised the royal household, and afterward made pilgrimages to the shrines of St. Olaf at Trondhjem, and of St. James of Compostella in Spain. After the death of her husband in 1344, Bridget founded the monastery of Vadstena, in East Gothland, whose members became known as Brigittines (q.v.). She was canonized in 1391 by Pope Boniface IX. She wrote *Revelationes,* an account of her visions from childhood onward.

BRIDGET OF KILDARE, Saint. See Brigid of Kildare, Saint.

BRIDGETON, county seat of Cumberland Co., N.J., situated on both sides of Cohansey Creek, about 38 miles s. of Camden, in a truck-farming region. The city is the center of an oyster industry, and a packing and shipping center for peas, beans, tomatoes, and fruits; and contains canneries, nurseries, textile mills, and a large glass factory. In 1716, when a bridge was built over the creek, the city received its first name, Cohansey Bridge; later it became Bridge Town; then Bridgeton. Among the 18th-century buildings in Bridgeton are the Broad Street Presbyterian Church (1792), the General Giles Manor House (1792), and the Masonic Hall (1797). Pop. (1950) 18,378.

BRIDGETOWN, capital of Barbados, British West Indies, situated on the s.w. coast of the island, on Carlisle Bay. It is a center of trade in sugar, molasses, rum, and edible oils. Founded in 1628, the town at first was called Indian Bridge, from an aboriginal structure which spanned a nearby creek. Bridgetown is the residence of the bishop of Barbados. Pop. (1953 est.) 15,000.

BRIDGMAN, PERCY WILLIAM (1882–), American physicist, born in Cambridge, Mass., and educated at Harvard University. He joined the physics department of Harvard University in 1910 and was appointed full professor in 1919. From 1926 to 1950 he served as Hollis professor of mathematics and natural philosophy at Harvard; subsequently, until his retirement in 1954, he was Higgins university professor of physics, a post permitting him to teach and to conduct research in any department or school of the university. A pioneer in the study of phenomena associated with high pressures, Bridgman made outstanding contributions to this field, notably in the development of new techniques by which available laboratory pressures were increased nearly a hundredfold. He is also known for his research in electrical conduction and in thermodynamics, and for his critical analyses of the conceptual foundations of physics. He received many honors for his work, including the 1946 Nobel Prize in physics. Among his writings are *The Logic of Modern Physics* (1927), *The Physics of High Pressure* (1931), *The Nature of Physical Theory* (1936), *The Nature of Thermodynamics* (1941), *Reflections of a Physicist* (1950), and *The Nature of Some of Our Physical Concepts* (1952).

BRIEUX, EUGÈNE (1858–1932), French dramatist, born in Paris. He began his career as a journalist, and at the age of 21 collaborated with Gaston Salandri in the production of a one-act play, *Bernard Palissy*. He did not, however, begin writing seriously for the stage till 11 years later, when he made his first success with *Ménage d'Artistes* at the Théâtre Libre (1890). After this he became one of the most prolific of French dramatists. He was elected to the Academy in 1909. Among his plays are *La Robe Rouge* (1900), dealing with the injustice of the law; *Les Avariés* (produced in New York in 1913 as *Damaged Goods*); *Les Américains Chez Nous* (1920); *Trois Bons Amis* (1921); *L'Avocat* (1922); *L'Enfant* (1923); and *La Famille Lavolette* (1926).

BRIFFAULT, ROBERT STEPHEN (1876–1948), British anthropologist and novelist, born in London, and educated in medicine at the University of Florence and London University. After practicing medicine in New Zealand until 1919, Briffault established a reputation as an anthropologist. His most notable work in this field is *The Mothers* (1927), an ambitious and highly controversial attempt to prove that all primitive cultures are basically matriarchal (see MATRIARCHY) in structure. During the 1930's he abandoned anthropology to write a series of widely read novels, notably *Europa* (1935) and *Europa in Limbo* (1937), which embody bitter criticisms of contemporary European society and arguments for a program of communistic reform. Briffault's other anthropological writings include *The Making of Humanity* (1919), *Rational Evolution* (1930), and *Sin and Sex* (1931); among his later novels are *Fandango* (1940) and *The New Life of Mr. Martin* (1946).

BRIGADE, a tactical military unit consisting of a group of regiments or battalions acting together under one commander called a brigadier, brigadier general, or colonel commandant. This system of grouping was introduced about 1700 by the French generals Turenne and Condé and the English general Marlborough and was soon adopted by every army in Europe. The brigade consisted of one or more regiments of infantry, each with two or three battalions of 500 to 600 men, and one or more regiments of cavalry, each with four squadrons of 100 to 150 horsemen. There was no separate artillery, the guns being attached to the individual regiments.

In the U.S. a brigade, formerly consisting of about 6000 men divided into 2 or 3 regiments, no longer has a place in the regular divisional organization. The corresponding group, when set up for tactical purposes, is called a combat command. In continental European armies the peacetime strength of a brigade is two regiments. In England the brigade is still called by that name, but has no fixed strength or place in the organization of the army. See MILITARY ORGANIZATION.

BRIGGS, CHARLES AUGUSTUS (1841–1913), American theologian, born in New York City, and educated at the universities of Virginia and Berlin and at Union Theological Seminary. From 1874 to 1891 he was professor of Hebrew at Union Theological Seminary, and was then appointed its first professor of Biblical theology. In his inaugural address he expressed views on the authority of the Bible which caused him to be tried by the Presbytery of New York for heresy; though acquit-

British Travel Association

On the beach at Brighton, popular English seaside resort

ted, he was suspended from the Presbyterian ministry by the General Assembly. Rather than remove him from his post, the Seminary gave up its Presbyterian affiliation and became undenominational. In 1900 Briggs became an Episcopal clergyman. He wrote *The Ethical Teaching of Jesus* (1904), *The Fundamental Christian Faith* (1913), and *Theological Symbolics* (1914). He is one of the authors of *The New Hebrew Lexicon* (1906) and one of the editors of two important series of books: *The International Theological Library* and *The International Critical Commentary.*

BRIGGS, Clare A. (1875–1930), American cartoonist, born in Reedsburg, Wis., and educated at the University of Nebraska. Between 1896 and 1914 he contributed drawings to leading newspapers of St. Louis, Mo., and New York City, and established his reputation as a cartoonist for the Chicago (Ill.) *Tribune.* From 1914 until his death Briggs was associated with the New York Tribune Syndicate. He created a number of popular cartoon series, including *Skin-nay, The Days of Real Sport, Ain't It a Grand and Glorious Feeling, When a Feller Needs a Friend,* and *Mr. and Mrs.*

BRIGGS, Le Baron Russell (1855–1934), American educator, born in Salem, Mass., and educated at Harvard University. He joined the English department at Harvard in 1885, and later taught courses in creative writing to graduate students, influencing such American writers as John Dos Passos, Robert Hillyer, E. E. Cummings, and Conrad Aiken. Briggs was dean of the university from 1891 to 1902, when he became dean of the faculty of arts and sciences. From 1903 to 1923 he served as president of Radcliffe College but continued in his post at Harvard. An active opponent of the commercialization of college athletics, he served from 1912 to 1917 as president of the National Collegiate Athletic Association, an organization devoted largely to the encouragement of the amateur spirit in collegiate sports. Among his writings are *Routine and Ideals* (1904) and *Men, Women, and Colleges* (1925).

BRIGGS, Lyman James (1874–), American physicist, born at Assyria, Mich., and educated at Michigan Agricultural Col-

lege, the University of Michigan, and Johns Hopkins. In 1896 he took charge of the Physical Laboratory Division (now Bureau) of Soils in the United States Department of Agriculture, and in 1906 he became the physicist in charge of the Physical Laboratory of the Bureau of Plant Industry. In 1917 he was assigned to the Bureau of Standards, where he held various positions, including that of director from 1933 to 1945. He became a member of the National Advisory Committee for Aeronautics in 1933 and its vice-chairman in 1942. In 1937 he became chairman of the research committee of the National Geographic Society; in 1947 he headed the Society's expedition to Brazil to observe the total eclipse of the sun on May 20.

Briggs was one of the first American scientists to appreciate the importance of the discovery of uranium fission (see ATOMIC ENERGY). He was chairman of the "Advisory Committee on Uranium" which was appointed by President Roosevelt in 1939, and remained as chairman of a series of reconstituted committees under the National Defense Research Committee and Office of Scientific Research and Development through 1942, when the U.S. Army began to assume control of the project. Briggs is also noted for his experimental researches, particularly in the field of aerodynamics. He investigated the characteristics of airfoils and projectiles at supersonic speeds.

BRIGHAM YOUNG UNIVERSITY, a coeducational institution at Provo, Utah, founded as the Brigham Young Academy in 1875 by Brigham Young (q.v.) and administered by The Church of Jesus Christ of Latter-day Saints (see MORMONS). It received its present name in 1903. The university includes a college of liberal arts and sciences, schools of business, architecture, journalism and art, a teachers college, a graduate school, and an extension department. Programs of study are offered leading to bachelor's and master's degrees. Courses of study at the high school level are also provided. In 1953–54 the total enrollment was 6900, including 6500 full-time students; the faculty numbered 300, and the library contained 288,148 volumes.

BRIGHT, JOHN (1811–89), British statesman, born near Rochdale, Lancashire. He entered Parliament in 1843, and, with Richard Cobden (q.v.), he became known as an outspoken champion of financial reform and the repeal of the corn laws (q.v.). Like Cobden a member of the Peace Society, he energetically denounced the policy of the Crimean war (1854). When the Civil War in America broke out, he warmly supported the cause of the North, although his own business and the whole of the Lancashire cotton-trade suffered severely in consequence. In 1868 he accepted office as president of the Board of Trade, and was chancellor of the duchy of Lancaster in 1873, and again in 1881. He was appointed lord rector of Glasgow University in November 1880. In 1886–88 he opposed Gladstone's Home Rule policy. He is recognized as one of the most eloquent public speakers of his time. A collection of Bright's speeches was published at London in 1868 and his *Public Letters* in 1885.

BRIGHTON, municipal and county borough of East Sussex, England, situated on the English Channel, about 51 miles s. of London. It is an important seaside resort and fishing port. One of the features of the borough is the protective sea wall, nearly 4 m. long, and surmounted by a promenade. Another feature of the waterfront is Palace Pier, a structure over 1700 ft. long. Among the noteworthy edifices of Brighton is the Pavilion, constructed (1784–87) as a residence for the Prince of Wales (later King George IV). Purchased by Brighton in 1850, the Pavilion now houses a museum, picture galleries, and assembly halls. Hotels, theaters, public baths, and parks are numerous in the borough, and there are an aquarium and an excellent race course.

Founded probably in the 10th century and known originally as Brighthelmstone, Brighton was a fishing town until the construction of the Pavilion. As the seaside residence of the Prince of Wales, the town quickly became a fashionable resort. It was made a municipal borough in 1854 and a county borough in 1888. During World War II bombing attacks by the German air force caused extensive damage. Pop. (1953 est.) 157,200.

BRIGHT'S DISEASE. See NEPHRITIS.

BRIGID OF KILDARE, SAINT (453–523), also called ST. BRIDE or ST. BRIDGET, a patron saint of Ireland, born in Faughart, County Louth. She was the daughter of a prince of Ulster. In 468 she became abbess of the convent of Cill-Dara on the site of the present city of Kildare. In later years she established four monasteries. Her feast day is Feb. 1.

BRIGITTINES or **ORDER OF ST. SAVIOUR,** an order for nuns and monks founded by Saint Bridget (q.v.) in Vadstena, Sweden, about 1346, and approved in 1370 by Pope Urban V. The primary purpose of the order,

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View of the city of Brisbane, Australia

which is a branch of the Augustinians (q.v.), is the translation of writings on religious subjects and the spread of literary culture in general. It was well established in Scandinavia and England until suppressed or driven out by the Reformation toward the end of the 16th century. Today it exists chiefly in Spain, where it was established in the 17th century, in a modified form, by a Carmelite nun, Marina de Escobar (1554–1633).

BRIHASPATI (Skr. *Brhaspati*), a Hindu god prominent in the Rig-Veda, but of less importance in the later mythology of India. His name appears frequently also in the form *Brahmanaspati,* "Lord of Strength" or "Lord of Prayer". As the incarnation of the *brahman-lord* he appears to have been the prototype of the god Brahma, the head of the later Hindu Trinity.

BRIL, the name of two Flemish landscape painters, brothers, born in Antwerp: **1.** MATHYS (1550–84), noted for his fresco landscapes painted for the Vatican under the patronage of Pope Gregory XIII. **2.** PAUL (1554–1626), one of the best Flemish landscape painters of the period. His frescoes and oil paintings are in the Vatican, Santa Maria Maggiore, and other Roman churches. Notable among his works is the large painting "Martyrdom of St. Clement" (Sala Clementina, Vatican).

BRILL (*Psetta laevis*), a common flatfish (q.v.) belonging to the same genus as the turbot, from which it is distinguished by its lesser height in proportion to length, by the absence of bony tubercles, by the small, almost smooth scales, by the different curve of the lateral line, and by the reddish-brown spots on the grayish brown of the "upper" side. It is a common fish of the E. Atlantic Ocean, and is abundant off some parts of the British coast. The brill is highly valued as a food fish. See TURBOT; FLOUNDER.

BRILL, ABRAHAM ARDEN (1874–1948), American psychiatrist, born in Kanczuga, Austria (now Poland), and educated at Columbia University in New York City, where he received a degree of M.D in 1903. Tests performed by Brill and Carl Jung (q.v.) on patients at the Zurich (Switzerland) Psychiatric Clinic in 1907 corroborated the theories of Sigmund Freud, founder of psychoanalysis (q.v.), then also in Zurich. Brill introduced psychoanalysis into the United States in 1908. He was a lecturer on abnormal psychology at New York University from 1914 to 1925, held professorships at Columbia University and the New York Post-Graduate Medical School, and served as consulting psychiatrist at Bellevue Hospital. He is known as one of the principal exponents of Freudian psychology in this country and as a translator of Freud's works. He also wrote *Psychoanalysis: Its Theories and Practical Application* (1921), *Fundamental Conceptions of Psychoanalysis* (1922), and *Lectures on Psychoanalytic Psychiatry* (1947).

BRILLAT-SAVARIN, ANTHELME (1755–1826), French politician and writer, born at Belley. During the French Revolution he fled to Switzerland, and later resided for a time in America, where he played in the orchestra of a theater in New York. He returned to Paris in 1796, and served as judge of the Court of Cassation under Napoleon. His *Physiologie du Goût* (1825), a compendium of the art of dining, has been repeatedly

republished and translated into many languages.

BRIMSTONE. See SULFUR.

BRINDABAN, town of Uttar Pradesh State, Union of India, situated on the Jumna R., about 80 miles S. of Delhi. It is a Hindu holy city, especially sacred to worshipers of the deity Krishna, and is visited annually by pilgrims from all parts of the country. Shrines and temples in the town number about 1000. Noteworthy among the temples is Govind Deva, a red-sandstone edifice constructed in 1590. Pop., about 30,700.

BRINDISI (anc. *Brundisium* or *Brundusium*), capital and seaport of the province of the same name, Apulia, Italy, about 40 miles E.N.E. of Taranto. The chief exports include wine, olive oil, and figs; the principal import is coal. Among noteworthy structures in the city are two 11th-century churches; the cathedral, parts of which date from the 11th century; and a 13th-century castle. The province of Brindisi is a fertile agricultural region, noted especially for the growing of olives. A place of great antiquity, the city was the principal naval station of the Romans on the Adriatic Sea. It was badly damaged in the wars that followed the collapse of the Western Roman Empire, and in 836 was sacked and destroyed by the Saracens. Rebuilt in the 11th century, it was a port of embarkation during the Crusades. In 1456 an earthquake devastated the city. The commercial importance of Brindisi in modern times dates from the opening of the Suez Canal in 1869, when it became a port of call for steamships operating to and from the Orient. During World War II the port was an important naval station. Area of province, 709 sq.m.; pop., about 354,000. Pop. of city, about 41,600.

BRINE SHRIMP, small, branchiopod crustacean of the genus *Artemia*, found in the evaporating pools of saltworks and in briny lakes throughout the world, where virtually no other form of life can exist. The full-grown brine shrimp is about half an inch long, with flat leaflike legs, and a long "tail" composed of the last eight segments of the body. It has no shell and is transparent. See BRANCHIOPODA; PHYLLOPODA.

BRINK, BERNARD TEN (1841–92), Dutch philologist, born at Amsterdam and educated in Germany, at Münster and Bonn. In 1870 he became professor of modern languages and literature at Marburg, and in 1873, at Strasbourg, he occupied a similar post. Among his works are books on Chaucer (1870 and 1884), and Beowulf (1882), a history of English literature (1874), and lectures on Shakespeare (1895).

BRINTON, DANIEL GARRISON (1837–99), American surgeon and anthropologist, born in Thornbury, Pa., and educated at Yale and at Jefferson Medical College. He subsequently studied in Paris and Heidelberg, and after serving as an army surgeon became professor at the Philadelphia Academy of Natural Science. He was an authority on ethnology and folklore. His works include *Library of Aboriginal American Literature* (8 vols., 1882–85), *The Myths of the New World* (1868), and *The American Race* (1892).

BRISBANE, capital and seaport of Queensland State, Australia, situated on the Brisbane R., about 15 m. inland from the river's mouth at Moreland Bay. It is a well-planned municipality, with broad, straight streets, numerous parks, and many modern buildings. Noteworthy structures include Parliament House, the town hall, Brisbane Museum, and the buildings of Queensland University, founded in 1911. A dredged channel in the Brisbane R. makes the city accessible to ocean-going vessels. Port facilities include dry docks and more than 2 m. of wharfage. Approximately two thirds of the foreign trade passing through Brisbane consists of outbound shipments. Wool is the chief item of export; other leading exports are frozen meat, hides, sugar, dairy products, corn, pearl shell, and coal. Several railway lines link the city with all major points in Australia and with the surrounding region, one of the most productive agricultural and mining areas in the Commonwealth. Brisbane is an important manufacturing center, with diversified industries, including food processing, tanning, automobile assembling, brewing, and the manufacture of lumber, clothing, tobacco products, boots and shoes, and machinery.

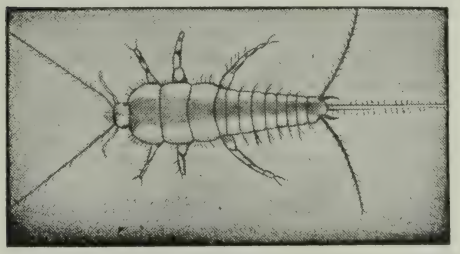
Founded as a British penal station in 1824, Brisbane was named in honor of the Scottish astronomer and administrator Sir Thomas Makdougall Brisbane, then governor of New South Wales. It was opened to free settlers in 1842, and in 1859 became the capital of the newly created colony of Queensland. Pop. (1951) 450,300.

BRISBANE, ARTHUR (1864–1936), American newspaper editor, born in Buffalo, N.Y. He began newspaper work (1887) in New York City as a reporter for the *Sun*, later becoming that paper's London correspondent. Later he was editor of the *Evening Sun*, next being managing editor of the *World* for seven

years. In 1897 he accepted the editorship of the New York *Evening Journal.* The immense combined circulation of the *Journal* and other Hearst newspapers throughout the country gave Brisbane an opportunity for wide influence. He was a special lecturer before the School of Journalism of Columbia University in 1913. He bought the Washington *Times* in 1917 and the *Evening Wisconsin* in 1918. Both of these he sold to William Randolph Hearst in the following year. In 1918 he became editor of the Chicago *Herald* and *Examiner.* He resigned as editor of the *Evening Journal* in 1921, but continued to write editorials and a column for the Hearst newspapers.

BRISSOT, JACQUES PIERRE, assumed surname DE WARVILLE (1754–93), French journalist and revolutionist, born in Chartres, and educated in law. In 1791 he wrote *Théorie des Lois Criminelles,* a treatise on the philosophy of criminal law. This work and *Bibliothèque Philosophique du Législateur* (1782), which also deals with the philosophy of law, reflect the influence of the authors of the French *Encyclopédie* (see ENCYCLOPEDISTS), especially the philosopher Jean Jacques Rousseau. Through his authorship of a series of pamphlets on political and economic problems, Brissot soon incurred the enmity of the authorities. He was imprisoned in the Bastille for four months on the false charge of having written a brochure against the government. Later he was compelled to take refuge in England. There he founded, in 1788, the Société des Amis des Noirs (Society of the Friends of the Negroes) to promote abolition of slavery and the slave trade. He visited the United States in the same year on an abolitionist mission.

On the outbreak of the French Revolution he returned to France and volunteered his services in the republican movement. He took part in the revolutionary attack (July 14, 1789) on the Bastille. As editor (1789–93) of the republican journal *Patriote Français,* Brissot achieved prominence as a leader of the faction of moderate republicans later known as the Girondists (sometimes Brissotins). In 1791 he was elected to the Legislative Assembly, the supreme legislative organ of France. He became a member of the diplomatic committee of the Assembly, and in that capacity played a prominent role in the development of French foreign policy, particularly the policy that led (April, 1792) to war with the Holy Roman Empire. Later in 1792 he was elected to the National Convention, the body that supplanted the Legislative Assembly. With other leading Girondists he voted in the National Convention against the death penalty for King Louis XVI. His conservative republicanism brought him into conflict with the Jacobins, the radical wing of the French revolutionary movement. In June, 1793, shortly after the Jacobins obtained control of the National Convention, Brissot and thirty other prominent Girondists were arrested. He and twenty of his colleagues were guillotined on the following Oct. 31.



Bristletail, or silverfish (Lepisma saccharina)

BRISTLETAIL, any small wingless insect of the order Thysanura, regarded as the simplest and lowest of all true insects. It dwells in dark, damp places under bark or stones, and is a common household pest, infesting basements, bathrooms, and kitchens. The commonest bristletails belong to the genera *Lepisma* and *Thermobia,* and are known also as silverfish (q.v.), fish moths, or firebrats. They are swift, agile creatures, having flat, fish-shaped bodies, covered with silvery scales; long, threadlike antennae; and two or more caudal filaments.

BRISTOL, city of Hartford Co., Conn., 18 miles S.W. of the city of Hartford. Its principal products are ball bearings, coaster brakes, clocks, watches, brass goods, iron castings, springs, trunk hardware, knitted goods, fishing tackle, golf clubs, archery equipment, calculating machines, tools, and electric motors. Originally a part of the town of Farmington, Bristol was incorporated as a separate town in 1785, and as a city in 1911. Pop. (1950) 35,961.

BRISTOL, borough of Bucks Co., Pa., situated on the Delaware R., about 20 miles E.N.E. of Philadelphia. It is an industrial city, surrounded by a fertile farming area. The chief manufactures are carpets, woolen goods, automobile parts, metal products, chemicals, whisky, and soap. Founded in 1697, Bristol was one of the first settlements established in Pennsylvania after the English colonizer in America William Penn received his charter for the province. It was origi-

nally called Buckingham, and was incorporated as the borough of Bristol in 1720. Pop. (1950) 12,710.

BRISTOL, city of Sullivan Co., Tenn., situated on the Tennessee-Virginia boundary, contiguous with the city of Bristol, Va., and about 21 miles N.N.E. of Johnson City, Tenn. State Street, delineating the State line, is the main thoroughfare of both cities. Bristol is the shipping, trading, and industrial center of a mining, lumbering, and livestock-raising region. Industries in the city include the manufacture of wood pulp and paper, furniture, rayon, mine cars, and leather products. King College, a coeducational school founded in 1867, is located in Bristol. Pop. (1950) 16,771.

BRISTOL, city in, but politically independent of, Washington Co., Va., situated on the Virginia-Tennessee boundary and contiguous with the city of Bristol, Tenn. State Street, delineating the State line, is the main thoroughfare of both cities. Bristol is a livestock-trading and industrial center, with plants engaged in the manufacture of textiles, clothing, pharmaceuticals, lumber, steel products, and machine tools. Sullins College (1870) and Virginia Intermont College (1884), junior colleges for girls, are located in the city. Pop. (1950) 15,954.

BRISTOL, county borough, city, and seaport of Gloucestershire and Somersetshire, England, situated on both banks of the Avon R. at its confluence with the Frome R., about 118 miles W. of London. The Avon R. forms the boundary between Somersetshire and Gloucestershire at Bristol, and the main portion of the city lies in Gloucestershire. For administrative purposes it is outside the jurisdiction of either county.

Bristol is one of the chief manufacturing and shipping centers of Great Britain. Its harbor is accessible to the largest ocean-going vessels, and the port is equipped with several dry docks, extensive wharfage, cold-storage warehouses, and facilities for the storage and transshipment of grain and petroleum, two of the leading imports. Other leading imports are raw sugar, fruit, tobacco, cattle, and hides. Tin, salt, and various locally made products comprise the chief exports. Aircraft production is the principal manufacturing industry. Sugar refining, shipbuilding, brewing, and the manufacture of machinery, chemicals, glass, lumber, soap, tobacco products, pottery, and chocolate are other major industries.

The city contains many splendid examples of medieval architecture. The 14th-century church of St. Mary Redcliffe, in the English Gothic style, is regarded as one of the most beautiful parish churches in Great Britain. Portions of Bristol cathedral, including the chapter house and the west portal, date from the 12th century and are in the Norman architectural style. St. Mark's Chapel, constructed in 1285 and restored in the 19th century, the church of St. James (1130), and the church of St. John (15th century) are other noteworthy ecclesiastical edifices. Among notable secular edifices are those of Bristol University, the city's principal institution of higher learning; Bristol Central Library; Bristol Art Gallery; Bristol Museum; and the Merchant Venturers' Almshouses. The last-named structure dates from 1699.

The Saxons settled on the site of the present-day city about 1000 A.D. *Bricg* ("bridge"), the Saxon name for the settlement, eventually evolved into "Bristol". During the reign (1017–35) of the Danish ruler of England King Canute, Bristol became a center for wool trade with Ireland, and in 1172 King Henry II issued a charter making the Irish city of Dublin a colony of Bristol. In subsequent years the wool trade was extended to the Baltic countries. Tanning and the manufacture of soap became important industries during this period. Clothmaking was introduced during the reign (1327–77) of King Edward III, and in the 15th century Bristol merchants developed a flourishing trade in cloth with the Baltic countries, France, Spain, and the countries of the Near East.

The Italian navigator John Cabot sailed from Bristol in 1497 and rediscovered the mainland of America. In the following years Bristol merchants carried on trade with the Spanish colonies in America and engaged in the slave trade. During the Civil War (1642–49) in England between the Royalists and the Parliamentarians, Bristol was held alternately by the contending sides. The cloth trade declined in the 18th century, but Bristol continued to prosper because of the slave trade and the development of new industries, including the manufacture of tin, brass, copper, and iron products.

High docking fees, the abolition of the slave trade, and the rise of Liverpool as a port resulted, early in the 19th century, in a decline in the prosperity of Bristol. However, after the middle of the century trade revived. In 1884 the city of Bristol bought the docks at the mouth of the Avon R. With the extension (1902–08) of those facilities the city again became one of England's leading seaports. In 1941–42, during World War II,

Bristol was severely bombed by the German air force, and a number of the city's notable buildings were badly damaged. Pop. (1951 prelim.) 442,881.

BRISTOL BAY, arm of the Bering Sea, lying immediately N. of the peninsula of Alaska. The bay is noted for its rich salmon fisheries.

BRISTOL CHANNEL, arm of the Atlantic Ocean, projecting into W. Great Britain, and lying between S. Wales and Monmouthshire on the N., and Devonshire and Somersetshire on the S. Approximately 85 m. long and from 5 to 43 m. wide, the channel has an irregular coast line with a total length of about 225 m. The E. extremity of the channel merges with the estuary of the Severn R. Extremely high tides (up to 40 ft.) occur in the channel, and it is navigable by ocean-going vessels as far E. as the port of Bristol.

BRISTOW, BENJAMIN HELM (1832–96), American lawyer and politician, born in Elkton, Ky., and educated at Jefferson College. He practiced law in his native State until the beginning of the Civil War, when he volunteered for service in the Union Army. He soon rose to the rank of colonel. Bristow was appointed United States solicitor general in 1870. From 1874 to 1876 he was secretary of the treasury, and in that capacity directed the prosecution of the so-called "Whisky Ring" (q.v.). His success in this work gained Bristow a reputation as a reformer, and at the Republican National Convention of 1876 he received 113 votes on the first ballot for Presidential candidate.

BRITAIN (Lat. *Britannia;* Gr. *Brettania*), designation applied in antiquity to what is now the island of Great Britain and sometimes, by extension, to the group of islands known collectively as the British Isles. In common usage it is an abbreviated styling of "Great Britain". *Brettanikoi Nesoi,* the Greek term for "British Isles", was first used (4th cent. B.C.) by the Greek philosopher Aristotle; the Latin form was first employed (1st cent. B.C.) by the Roman soldier and statesman Gaius Julius Cæsar. Both the Greek and Latin terms are believed to be corruptions of a Celtic place name. The first detailed description of the island and its inhabitants was written by the Greek navigator and geographer Pytheas, who explored the coastal region late in the 4th century B.C. (see BRITONS).

Britain did not begin to figure significantly in the history of Western civilization until 55 B.C., when it was raided by Gaius Julius Cæsar. Cæsar returned in the following year, conducted a successful campaign against the southern tribes, and obtained from one of their chieftains an agreement to pay tribute. Military occupation of the subjugated area was not attempted, however, and the natives retained their political freedom during the reigns of the Roman emperors Augustus, Tiberius, and Caligula, who were involved elsewhere with imperial problems. Emperor Claudius initiated the actual conquest of Britain in 43 A.D. By 47 A.D. his legions had occupied all of the island S. of the Humber and E. of the Severn rivers. The tribes, notably the Silures (q.v.), of what are now the Wales and Yorkshire regions resisted stubbornly for more than thirty years, a period that was marked also by the abortive and bloody rebellion (61 A.D.) led by the native queen Boadicea (q.v.). About 79 A.D. Roman legions under three of the best generals of the empire subdued the tribes in Wales and established partial control over those in Yorkshire. Between 79 and 85 A.D. forces commanded by the Roman soldier and statesman Gnaeus Julius Agricola moved through the northern section of the island, completing its conquest to the Firth of Forth. Agricola also pushed northward into Caledonia (now Scotland), but the region between the firths of Forth and Clyde remained disputed territory. The Caledonian tribes, better known as the Picts (q.v.), retained their independence.

Little is known of the relations between the Britons and their conquerors between 85 and 115 A.D. Shortly after 115, the natives rose in revolt against their overlords and annihilated the Roman garrison at Eboracum (now York). As a result, Emperor Hadrian visited Britain in 122 A.D., and began the construction of a rampart, or wall, known by his name, from Solway Firth, on the Irish Sea, to the mouth of the Tyne River, a distance of about 70 miles. Fragments of this wall still exist. Twenty years later another continuous rampart, 37 miles long and called the Wall of Pius, was built across the narrowest part of the island, from the Firth of Forth to the Firth of Clyde. The region between the two walls served as a first-line defense area against the unsubdued Caledonians. Intermittent warfare raged in this area until the early years of the 3rd century. In 208 Emperor Lucius Septimus Severus led a military expedition against the northern tribesmen, whom he succeeded in driving beyond Hadrian's Wall. The wall represented the

Gaius Julius Cæsar landing with his legions on the coast of Britain, 55 B.C.

northern Roman frontier during the following two hundred years, a period of relative peace marked, especially during the 3rd century, by the deepening of Roman cultural influences among the Britons of the subjugated areas.

During the period of conquest and military campaigns the native tribes had acquired familiarity with many features of Roman civilization, including its legal and political systems, architecture, and engineering. A number of towns, among them Camulodunum (now Colchester) and Lindum (now Lincoln), had been established in the 1st century A.D. Upwards of fifty additional towns, including Londinium (London), Aquæ Sulis (Bath), and Ratæ (Leicester), were subsequently founded. These strongholds were linked by a vast network of military highways, many remnants of which survive

As attested by the archeology of the occupation period, the Romans brought their entire culture to Britain. Excavations have revealed ruins of houses, baths, flues, mosaic pavements, painted walls, metallic implements and ornaments, weapons, tools, utensils, coins, sculptures, and numerous other relics. In the main, however, only the native nobility, the wealthier classes, and the residents of the towns accepted the Roman way of life and the Roman language. The Britons inhabiting the outlying regions retained their native culture. After 409, when the last of the Roman legions were withdrawn from the island, Celtic culture again became predominant and Roman civilization in Britain rapidly disintegrated. Roman influence virtually disappeared during the Teutonic invasions, which began about the middle of the 5th century. See ENGLAND; SCOTLAND; WALES.

BRITANNIA METAL, an alloy containing tin and antimony, first made in Sheffield, England, in 1770. The commonest form contains 90% tin and 10% antimony, but these proportions may vary, and large amounts of zinc and small amounts of lead, copper, and bismuth may be added. A variety containing lead and bismuth is called *queen's metal.* The addition of copper makes the alloy more ductile and gives it a yellow tint. By varying the composition and methods of treatment, britannia metal can be made in a variety of colors.

Britannia metal is harder than pewter, and by the early 19th century replaced pewter for many purposes, particularly spoons, coffeepots, and similar tableware. Later it served as a base for silver plating, in the manufacture of silver-plated articles. It is widely used today as a base for ornamental borders and similar decorations on silver-plated dishes, trays and other articles. It may be stamped, cast, or "spun"; in spinning, a sheet of metal is placed over a suitably shaped model which is turned on a lathe; a hard tool is pressed against the metal, forcing it to take the form of the model.

BRITISH CAMEROONS. See CAMEROONS.

BRITISH CENTRAL AFRICA PROTECTORATE. See NYASALAND.

BRITISH COLUMBIA, province of Canada, bounded on the N. by Yukon Territory and Northwest Territory, on the E. by Alberta Province, on the S. by the United States (Montana, Idaho, and Washington), and on the W. by Alaska and the Pacific Ocean. Included in the province are Vancouver Island and Queen Charlotte Islands (qq.v.).

Victoria (q.v.) is the capital of British Columbia, and Vancouver (q.v.) is the largest city. Other important cities and towns include New Westminster, Prince Rupert, Nelson, Kamloops, and Trail. The area of the province is 366,255 sq.m., including 6976 sq.m. of inland water surface. The population (1951) is 1,165,210.

With the exception of its N.E. corner, a lowland region, British Columbia falls entirely within the belt of the mountainous highlands known as the Cordillera of North America. The eastern portion of the Cordillera consists of the Rocky Mountains and various subsidiary ranges, extending in a generally N.W. to S.E. direction across the length of the province. South of lat. 54° N., this system marks the boundary with Alberta. Mt. Robson (12,972 ft.), the highest peak of the Canadian Rockies, is situated in this region. Among the subsidiary ranges of the system are the Purcell Range, with a maximum elevation (Mt. Farnham) of 11,342 ft.; the Selkirk Mountains, with a maximum elevation (Mt. Sir Donald) of 11,123 ft.; and the Cariboo Mountains, with elevations up to 11,750 ft. The Coast Mountains, a continuation of the Cascades, border the British Columbia coast line, which is deeply indented. Mt. Waddington (13,260 ft.) is the highest summit of the Coast Mountains. Between this range and the Rocky Mountains system is a vast plateau region. One of the outstanding features of the interior plateau is the large number of elongated lakes. Numerous rivers, including the Fraser, Columbia, Kootenay, Skeena, Taku, Peace, Liard, and Nelson, traverse the province. British Columbia is famed for its rugged scenery, and many areas have been set aside as parks, notably Glacier, Kootenay, Mount Revelstoke, and Yoho national parks, and the Garibaldi, Hamber, Kokanee, Strathcona, Tweedsmuir, and Wells Grey provincial parks. In the interior of the province the climate is dry, varying from temperate in the south to cold in the north, with moderate snowfall and rainfall. Due to oceanic influences, the climate of the coastal regions is mild.

Forestry, farming, mining, and fishing are the principal industries. In the forested areas, covering an estimated 100,000,000 acres, are extensive stands of Douglas fir, various species of spruce, and other timber. The value of forest production in 1951 was nearly $505,000,000. British Columbia ranks second in the Dominion in the production of fruits, principally apples, pears, grapes, and peaches. Other farm products include grains, potatoes, turnips, beets, peas, hops, beans, honey, tobacco, and livestock (beef and dairy cattle, horses, sheep, goats, and hogs). In 1951 the value of agricultural production totaled about $160,000,000. The province ranks third in Canada in the value of mineral output. Lead, sulphur, copper, zinc, gold, silver, and asbestos are mined in large quantities; iron ores, uranium ore, chromite, barite, manganese, antimony, tungsten, graphite, gypsum, salt, and talc are also produced. Mineral output in 1951 was valued at about $176,300,000. Salmon, halibut, herring, and cod are the chief products of the fisheries, which are among the most important in the Dominion. In 1951 the total catch was valued at more than $83,800,000. Among the leading manufacturing industries of the province are the production of lumber, pulp, and paper; fish curing and canning; meat packing; ore refining; and shipbuilding.

Executive authority in the provincial government is vested in a lieutenant governor appointed by the governor general of the Dominion, and in an executive council (cabinet) responsible to the legislature. The legislature, a unicameral body known as the Legislative Assembly, consists of forty-eight members elected for five-year terms by direct popular vote. British Columbia is represented in the Dominion Parliament by six members in the upper house and eighteen members in the lower house.

Canadian Pacific Railway

Canyon of the Fraser River, British Columbia

History. The first European to sight the coast of what is now British Columbia was probably the English navigator Sir Francis Drake, who cruised northward along the North American coast in the summer of 1579. In 1778 the British explorer Captain James Cook explored part of the coast line, and ten years later John Meares, a former lieutenant in the British navy, established a settlement on Nootka Island. The island was seized in the following year by Spain, which claimed the entire coast of North America as far N. as Alaska. For some time war appeared imminent, but in 1793 the difficulties between the two countries were settled by arbitration, England receiving all the N.W. coast from Nootka Sound to the Russian trading posts in Alaska. Meanwhile, in 1792, the British explorer Captain George Vancouver circumnavigated the island which now bears his name and explored a part of the coast of the mainland, and in 1793 the Scottish explorer Alexander Mackenzie made the arduous overland journey from Lake Athabasca to the coast on behalf of the Northwest Company, a trading organization. For many years the territory now included within the province formed part of "New Caledonia", an immense tract in which the Northwest Company and later the Hudson's Bay Company (with which the Northwest Company was amalgamated in 1821) held exclusive trading rights. A fort was built by the Hudson's Bay Company on the site of the present city of Victoria in 1843.

In 1849 Vancouver Island was constituted a crown colony, but it remained under the virtual control of the company. Gold was discovered in the bed of the Fraser River in 1856. Large numbers of settlers were drawn to New Caledonia, and in 1858 the region was organized as a crown colony under the name British Columbia. The boundaries of the colony were delineated in 1863. The two colonies were united as British Columbia in 1866, and the newly created province was admitted into the Dominion of Canada in 1871.

BRITISH COMMONWEALTH OF NATIONS. See COMMONWEALTH OF NATIONS.

BRITISH EAST AFRICA, formerly the name of Kenya, but now a geographical desig-

nation applied to British-controlled Kenya Colony and Protectorate, Uganda Protectorate, Zanzibar Protectorate, and the mandated Tanganyika Territory (qq.v.) in E. Africa.

BRITISH EMPIRE, former collective designation for the United Kingdom (q.v.) and the various dominions, colonies, and other entities owing allegiance to the British crown. For a period after 1921 the designation was applied only to the British colonial possessions. In official usage, the components of the former British Empire are now designed collectively as the Commonwealth of Nations (q.v.). The components are as follows.

EUROPE: Great Britain, Northern Ireland, Isle of Man, Channel Islands; Gibraltar and Malta.

ASIA: Aden; British North Borneo, Brunei, Sarawak; Ceylon and dependency; Cyprus; Hong Kong; Singapore and dependencies; the Federation of Malaya; India; and Pakistan.

AFRICA: Union of South Africa and mandated territory; Kenya; Uganda; Zanzibar; Mauritius and dependencies; Nyasaland; St. Helena, Ascension, and dependencies; Seychelles and dependencies; British Somaliland; Basutoland, Bechuanaland, Swaziland; Southern Rhodesia, Northern Rhodesia; Nigeria; Gambia; Gold Coast, including Ashanti and the Northern Territories, and Togoland (trusteeship); Sierra Leone; Tanganyika (trusteeship); Cameroons (trusteeship); and Anglo-Egyptian Sudan (under condominium, United Kingdom and Egypt).

AMERICA: Canada; Bermuda; Falkland Islands and dependencies; British Guiana; British Honduras; and the British West Indies.

OCEANIA: Australia, including trusteeship and other territories; New Zealand, including trusteeship and other territories; Fiji Islands; and the British Western Pacific Islands, of which the New Hebrides group is jointly governed with France, while Canton and Enderbury, belonging to the Phoenix group of the Gilbert and Ellice Islands Colony, are jointly governed with the United States.

BRITISH GUIANA, crown colony of the United Kingdom, situated in northeastern South America and bounded on the N. by the Atlantic Ocean, on the E. by Surinam, on the S. by Brazil, and on the W. by Brazil and Venezuela. Essequibo, Demerara, and Berbice (q.v.) are the administrative divisions, known as counties. Georgetown (q.v.) is the capital and leading port. Area, about 83,000 sq.m.; pop. (1955 est.) 485,000 (chiefly East Indians and Negroes; about 13,100 Whites of Portuguese, English, and Dutch descent; and about 19,000 Carib and Arawak Indians).

The terrain of British Guiana is highly diversified. Bordering the coast line is a belt of marshy lowlands, with a maximum breadth of about 40 m. Sloping upward from the coastal belt is a region of rolling uplands. Grassy plains, large tracts of forest, and long ranges of hills are characteristic of this region. Rugged mountain ranges demarcate the western and southern limits of the upland region. In the W. are the Pacaraima Mts., with a maximum elevation (Roraima) of 8620 ft. Several other peaks of the range are over 5000 ft. in height. The Serra Acarahy, which attains a maximum elevation of 2500 ft., is situated in the S. Numerous rivers, including the Essequibo, Cuyuni, Mazaruni, Courantyne (along the Surinam frontier), Demerara, and Berbice, traverse the colony. Some of the rivers form spectacular waterfalls, notably Kukenaam (2000 ft.) and Kaieteur (741 ft.). The colony has a tropical climate, but the high temperatures prevailing in the coastal regions are ameliorated during most of the year by ocean winds. Temperatures are generally lower in the upland areas.

Farming, mining, and forestry are the chief industries. Sugar cane is the principal crop; in 1952 the output totaled more than 242,000 long tons. Other important agricultural products include rice, coffee, cacao, fruits, and rubber. Pastoral enterprises include the breeding of cattle, horses, sheep, goats, and hogs. Bauxite, gold, and diamonds are the chief mineral products; the approximate respective yields in 1952 were 2,285,000 tons, 24,200 ounces, 39,300 carats. Among other mineral resources are deposits of petroleum, mica, manganese and columbite. Raw sugar, minerals, rum, rice, timber, charcoal, matches, molasses, molascuit (a cattle food made from molasses), coconuts, balata, and crude rubber comprise the chief exports. Imports include machinery, oils, fertilizers, cotton and silk textiles, medicines and drugs, flour, and condensed milk and other preserved foods. Transportation facilities include about 320 m. of inland waterways, nearly 100 m. of government-owned railroad lines, and about 550 m. of paved and unpaved roads. The colony is served by several international air-transport lines and by a number of steamship lines, mainly British, American, and Dutch.

British Guiana is governed according to the provisions of the constitution of 1953. By the terms of this document executive

authority is vested in a governor and a 10-member executive council. Legislative authority is exercised by a bicameral legislature which consists of a 9-member State Council, chosen by the governor, and a 27-member House of Assembly; all except 3 members of the latter are popularly elected. The House elects from its ranks six members of the executive council. See *History*, below.

History. The region comprising present-day British Guiana was first colonized (about 1613) by the Dutch. Numerous English settlers moved into the territory during the 18th century, and in 1781 it was seized by British privateers. Great Britain restored the region to the Netherlands in 1783. After changing hands several times during the Napoleonic Wars, it was ceded (1814) to Great Britain under the terms of the general peace settlement. Constituted a crown colony in 1831, British Guiana has been involved in several serious boundary disputes with Venezuela, notably in 1895. A protracted boundary dispute with Brazil was arbitrated in 1904. The ensuing decades were relatively uneventful. In 1940 during World War II, sites for air and naval bases were leased to the United States. The problems of economic expansion were of paramount importance in the postwar period. In 1949 the government launched a ten-year plan which provided for agricultural and industrial development and for more intensive exploitation of natural resources.

A new constitution was promulgated in April, 1953. In the general elections held on April 27, the left-wing People's Progressive Party (P.P.P.) won 75 percent of the seats in the House of Assembly, thereby gaining control of the government. Later in the year, Great Britain, charging that the P.P.P. intended to establish a procommunist state in British Guiana, dispatched naval and military units to the colony and suspended the constitution. A wholly-appointed interim government was installed in December. In January, 1954, a British commission of inquiry began a study of proposed changes in the suspended constitution.

BRITISH HONDURAS, crown colony of the United Kingdom, situated in Central America, and bounded on the N.W. and N. by Mexico, on the E. by the Caribbean Sea, and on the S. and W. by Guatemala. Belize, Corozal, Orange Walk, Stann Creek, Toledo, and Western comprise the administrative divisions, known as districts. Among the principal towns are Belize, the capital and chief seaport; Corozal (qq.v.); and Stann Creek (pop., about 8300). Area, 8688 sq.m.; pop. (1955 est.) 80,888.

Many islets (cays) and dangerous coral reefs fringe the coast line of British Honduras. Extending inland for several miles is a belt of swampy lowlands covered by tropical jungle; further inland is a broad belt of arable plains. The S. portion of the colony is traversed by mountain ranges, notably the Cockscomb Mts., with a maximum elevation (Mt. Victoria) of 3681 ft. The principal rivers are the Belize, the Hondo, which forms the boundary with Mexico, and the Sarstoon, which forms the S. boundary with Guatemala. More than half of the area of the colony is covered by forests. Among the trees of commercial value are mahogany, logwood, lignum vitae, cedar, ironwood, rosewood, and pine. Sarsaparilla, vanilla, and sapodilla (from which chicle is obtained) grow wild. The climate is hot and moist and malaria is prevalent.

Lumbering is the chief industry. Agricultural enterprises include the cultivation of corn, bananas, citrus fruits, coffee, sugar cane, and rubber. The principal exports are mahogany logs and lumber, pine lumber, bananas, chicle, and grapefruit juice.

The native population consists predominantly of an admixture of various racial types, including aborigines, Negroes, and such Caucasoids as English and Spanish. Small groupings of the aboriginal Maya Indians still inhabit the western and northern forested regions.

The colony is administered by a governor appointed by the British colonial office. He is assisted by a 7-member executive council and a 13-member legislative council. Of the 10 unofficial members of the latter, 6 are elected by the districts and 4 are chosen by the governor.

History. British Honduras is the site of the ancient Maya civilization (see MAYAS). In the 16th century the territory comprising the present-day colony was included in the viceroyalty of New Spain. English woodcutters came from the island of Jamaica early in the 17th century to lumber the mahogany and logwood of the region, and established a settlement on the Belize R. The Spaniards were unsuccessful in a number of attempts to dislodge the English colonists during the wars between Great Britain and Spain in the 18th century, and were finally defeated in 1798. In 1836, following the emancipation of Central America from Spanish rule, the Brit-

ish government claimed the right to administer the region (then known as Belize). The country was declared a British colony, subordinate to Jamaica, in 1862; it became a separate crown colony in 1884. For an account of Guatemalan claims to British Honduras, pressed after World War II, see GUATEMALA: *History*.

BRITISH INDIA, designation applied collectively to the seventeen Indian provinces formerly under direct British administration. On Aug. 15, 1947, when British paramountcy in India ended and Pakistan and the Dominion (later Union) of India were established, the predominately Moslem sections of British India were allocated to Pakistan and the predominantly Hindu sections to the Dominion of India. The provinces of British India, in descending order of population, were Bengal, United Provinces, Madras, Bihar, Punjab, Bombay, Central Provinces and Berar, Assam, Orissa, Sind, North-West Frontier Province, Delhi, Ajmer-Merwara, Baluchistan, Coorg, Andaman and Nicobar Islands, and Panth-Piploda (qq.v.). See INDIA, UNION OF; INDIA, NATIVE STATES OF; PAKISTAN. Area of British India, 865,446 sq.m.; pop. (1941) 295,808,722.

BRITISH ISLES, archipelago lying W. of the continent of Europe, from which it is separated by the North Sea, the Strait of Dover, and the English Channel. It consists of the large islands of Great Britain and Ireland; several island groups, namely the Orkney Islands, the Shetland Islands, the Hebrides, and the Channel Islands; and the Isle of Wight and the Isle of Man. Including numerous tiny islets, the archipelago aggregates about 5000 islands. Area, about 120,700 sq.m.; pop., about 54,500,000.

BRITISH MALAYA. See MALAYA, BRITISH.

BRITISH MUSEUM, state-supported national institution in London, founded in 1759, and including some of the greatest natural-history and art collections in the world. Its nucleus was the collection of the British physician and naturalist Sir Hans Sloane, which was sold to the government for $100,000 and housed in Montague House (1759) together with the Harleian and Cottonian libraries. The present building was completed in 1847. A reading room was erected (1854–57) at a cost of $700,000; a natural-history building, costing nearly $2,000,000, was completed in 1881; and the entire institution was enlarged and new galleries added on the north side in 1914. Eight departments, as they are listed and described below, now comprise the museum proper.

The *Printed Books* department contains approximately 4,000,000 books, including libraries donated by the royal family, the actor David Garrick's collection of plays (1779), the natural-history library of the naturalist Sir Joseph Banks (1820), and the collection of the bibliophile Thomas Grenville (1847), The *Manuscript* section contains 55,000 volumes, besides charters, seals, and Egyptian, Greek, and Roman papyri. It includes the Cottonian manuscripts, the Harleian Collection (q.v.), and the *Codex Alexandrinus*. The *Oriental Books and Manuscripts* department, originally part of the departments described above, was established as an independent section in 1892. The *Greek and Roman Antiquities* comprise a large variety of famous Greek and Roman objects of art. Among them are the Charles Townley collection of bronzes, gems, coins, and Greco-Roman sculpture; the frieze of the temple of Apollo at Bassae; the Elgin Marbles (q.v.); the Lycian monuments; and the Castellani collection of gold, silver, and gems. The *Coins and Metals* department contains Greek, Roman, medieval, modern English, and Oriental specimens. It includes the Wigan collection. *Egyptian and Assyrian Antiquities* comprise Egyptian, Babylonian, Assyrian, Phenician, and Semitic antiquities. The *British and Medieval Antiquities and Ethnographic Collections* are composed of objects found in the British Isles and elsewhere which throw light on life in the Middle Ages. The Christy and Slade collections are housed in this department. The department of *Prints and Drawings* contains a collection of national art. It includes the John Malcolm collection.

BRITISH NORTH AMERICA ACT, legislative enactment passed by the British Parliament (March 29, 1867) to provide for the merger of Upper Canada (Ontario), Lower Canada (Quebec), Nova Scotia, and New Brunswick into a federation with the title of "The Dominion of Canada". The Dominion now includes the whole of British North America, except the Bermuda Islands.

BRITISH NORTH BORNEO, crown colony of the United Kingdom, occupying the northernmost part of the island of Borneo, and bounded on the N.W. and N. by the South China Sea, on the N.E. by the Sulu Sea, on the S.E. by the Celibes Sea, on the S. by Indonesian Borneo, and on the W. by Sarawak. For administrative purposes the nearby island of Labuan is included in the colony. Jesselton

British Information Services

The British Museum in London

(pop. in 1951, 11,704) is the administrative center of the colony. Other important towns are Sandakan (pop. in 1951, 14,499), Kudat (1895), and Beaufort (1576). Area, 29,387 sq.m.; pop. (1955 est.) 377,324. See BORNEO.

British North Borneo is extremely mountainous, the only lowlands of importance being confined to the coastal region. A number of broad upland valleys, notably the valley of the Kinabatangan R., traverse the mountainous interior. The highest uplifts lie in the w. portion of the colony. Kinabulu (13,455 ft.) is the highest summit on the island. Both the coastal belt and the mountain slopes are heavily forested. Streams are numerous but, because of the rugged terrain, are generally swift and interrupted by rapids. In addition to the Kinabatangan R., which is navigable by light-draft vessels for about 120 m., the Labuk and Padas rivers are important waterways. The coast line, about 900 m. long, is indented by several large embayments and natural harbors. Tropical climatic conditions prevail throughout most of the colony. Precipitation exceeds 175 in. annually in certain areas, but in various localities an annual rainfall as small as 60 in. is common.

The forests yield considerable timber, cutch, rattans, and other products, and there are extensive mineral deposits, including petroleum, coal, gold, copper, tin, antimony, diamonds, iron, and sulfur. Exploitation of the colony's mineral wealth is hampered by inadequate transportation facilities. There is only one railway line (about 120 m. long) in the colony. Paved and second-class highways total about 580 m. in length. Agriculture, forestry, and fishing are the leading industries. Rubber, timber, coconuts and copra, cutch (a mangrove extract used for tanning), tobacco, manila hemp, sago, rice, rattans, dried fish, edible birds' nests, bêche-de-mer (or trepang, a sea cucumber), and seed pearls are the principal products. Trade is carried on chiefly with the United Kingdom and its various colonies, and almost entirely through the ports of Hong Kong and Singapore.

The bulk of the colony's population is composed of Kyaks, an aboriginal people of the Malayan linguistic stock. They are divided into a number of tribes, notably the Dusuns and Muruts, and dwell mainly in the interior. Head-hunting is practiced by

some of the Kyak tribes. Chinese, Malays, and several tribes representing an admixture of the aborigines, Chinese, and Malays predominate in the coastal areas.

The region came under British control in 1877 through concessions obtained by a British trading syndicate (later called the British North Borneo Company) from the sultans of Brunei and Sulu. The British North Borneo Company, under a royal charter granted in 1881 by Queen Victoria of Great Britain, took over the administration of the region. In 1888 North Borneo was made a British protectorate, but the company retained its administrative status. Japanese military forces occupied the protectorate in December, 1941, during World War II, and held it until the end of the war. On July 15, 1946, British North Borneo was proclaimed a crown colony.

BRITISH SOMALILAND or **SOMALILAND PROTECTORATE,** protectorate of the United Kingdom, situated in E. Africa, and extending along the S. coast of the Gulf of Aden for about 400 m. It is bounded on the W. by French Somaliland, on the S. and S.W. by Ethiopia, and on the S.E. and E. by Somalia, a U.N. Trust Territory; see ITALIAN SOMALILAND. Berbera (q.v.) is the largest town and chief seaport; other important towns include Hargeisa, the capital, (pop., about 30,000), Burao (about 10,000), Borama, Erigavo, and Las Anod. The protectorate is administered by a military governor, and is divided into six political divisions which have the names of the six principal towns cited above. Along the Gulf of Aden the terrain consists of a sandy coastal plain varying in width from about 10 to about 60 m. The plain is bordered by a series of mountain ranges with steep slopes on the seaward side. Elevations average between 4000 and 5000 ft. The interior terrain, a rugged plateau, ranges in elevation from about 7000 ft. in the N. to about 2000 ft. in the S. In the S. portion of the plateau is an arid region of grassy plains and thorn jungles. Vegetation consists chiefly of coarse grass and stunted thorn and acacia trees. Aromatic flora, yielding myrrh and frankincense, are indigenous to the mountain slopes, and one of the higher ranges has large stands of mountain cedar. Wildlife includes the lion, kudu, ostrich, and gazelle.

The principal occupation is livestock raising (mainly of camels, sheep, and goats). Because of the general aridity only a few limited areas are cultivable. Millet is the most important crop, grown chiefly in the western interior. Camel caravans are the principal means of transportation, but a number of the important towns are linked by motor highways. Sheep and goat skins, livestock, meat, ghee, ostrich feathers, and resins comprise the leading exports. Imports include cotton piece goods, rice, sugar, dates, and ironware.

The population consists almost entirely of Somalis, a Hamitic people (see SOMALI). Grouped in numerous tribes, they are largely nomadic. Mohammedanism is the predomiant religion.

Arab settlements were established in the coastal areas probably as early as the 7th century A.D. In the 13th century the region was controlled by an Arab state, known as the Empire of Abdel, which centered at the port of Zeila, directly across the gulf from Aden. The empire disintegrated, during the 17th century, into small, independent emirates and sultanates under Somali chiefs, but Zeila became a dependency of Yemen and hence was nominally within the Turkish empire. Despite Turkish claims, Egypt occupied the coastal towns and a part of the interior about 1875, but because of the revolt (1882) in Egyptian Sudan, Egyptian troops were withdrawn, and the British, who had taken Aden in 1839, thereupon occupied the territory to safeguard the route to India via the Suez Canal. In 1887 a British protectorate over the region was proclaimed. At first a dependency of Aden, the protectorate was placed under the administration of the British Foreign Office in 1898, and of the Colonial Office in 1905.

Native revolts made British control of the interior insecure from 1899 to 1910. In 1910 the British abandoned the interior and withdrew to the coastal region. They finally subdued the rebels in 1920. In 1940, during World War II, Italian forces invaded British Somaliland, expelling the British troops, but the country was retaken by the British in the following year. Area, 67,936 sq.m.; pop., about 700,000, including several thousand nonnatives.

BRITISH THERMAL UNIT, usually abbreviated to B.T.U., a quantity measurement of heat. One B.T.U. is the amount of heat necessary to raise the temperature of one pound of water from 39° F. to 40° F. It is equivalent to 252 gram calories.

See CALORIMETRY; HEAT.

BRITISH WEST AFRICA, the W. African colonial possessions of the United Kingdom, consisting of Nigeria, Gambia, Sierra Leone,

each a colony and a protectorate; Gold Coast Colony; Ashanti Colony; Northern Territories, a protectorate; and Togoland and Cameroons, each a United Nations trust territory. Area, 496,525 sq.m.; pop., about 27,000,000.

BRITISH WESTERN PACIFIC ISLANDS, all possessions (excluding the crown colony of Fiji) of the United Kingdom in the S.W. Pacific Ocean. The principal components are Gilbert and Ellice Islands Colony, British Solomon Islands Protectorate, Tonga or Friendly Islands, New Hebrides (governed jointly with France), and Pitcairn Island. Canton and Enderbury islands of the Phoenix Islands group of Gilbert and Ellice Islands Colony are governed jointly with the United States. The islands are administered by a high commissioner at Honaira, British Solomon Islands Protectorate. Area, about 19,050 sq.m.; pop., about 219,000.

BRITISH WEST INDIES, colonial possessions of the United Kingdom in the West Indies (q.v.), comprising all of the Bahama Islands; Jamaica, one of the Greater Antilles group and third-largest island of the archipelago; Trinidad and Barbados, two of the principal islands of the Lesser Antilles group; many of the Virgin Islands group; various islands of the Leeward Islands groups; and Dominica and a number of other islands of the Windward Islands group. In political geography the Britist West Indies is divided for administrative purposes into six colonies. In descending order of size, they are Jamaica, Bahamas, Trinidad and Tobago, Leeward Islands, Windward Islands, and Barbados. Each of the foregoing is the subject of a separate article. Area of British West Indies, 12,507 sq.m.; pop., about 2,411,000.

BRITOMARTIS, in ancient Cretan mythology, a chaste nymph. Pursued by King Minos of Crete, Britomartis cast herself into the sea and was made a goddess by Artemis, goddess of the moon. Britomartis was variously regarded as a goddess of birth and health and as the patroness of sailors, fishermen, and hunters. In one version of the legend she is represented as a moon goddess; her flight from Minos and her plunge into the sea are interpreted as representing the movements of the moon. Worship of Britomartis extended from Cydonia to Sparta, Ægina, and a number of Mediterranean islands. In *The Faerie Queene* (1590) by the English poet Edmund Spenser, Britomartis personifies virginal chastity and is one of the symbols representing Queen Elizabeth I of England.

BRITONS, name applied to the principal ethnic group native to Britain (q.v.) at the time of the Roman conquest of the island. In modern usage the word denotes also natives of Great Britain in general and natives of England in particular. Little authentic data regarding the antecedents of the ancient Britons has been unearthed. In the view of most historians the aboriginal inhabitants of the island were conquered (probably toward the end of the Bronze Age) by the Goidels, a Celtic-speaking people, of uncertain racial origin, from the Continent. During and after their conquest of the island the Goidels undoubtedly intermarried to some extent with the aborigines. Some of the latter withdrew to the northern part of the island. Probably in the 4th century B.C., the Brythons, another Celtic-speaking people from the Continent, invaded the island and subjugated the Goidels. To a large degree the Goidels were absorbed by their conquerors, but some of the Goidelic tribes fled westward to the islands subsequently named Ireland and the Isle of Man. By the middle of the 1st century B.C. the Britons were probably as advanced culturally as the Celtic-speaking peoples in Gaul. Close commercial ties linked Britain with Gaul and other parts of the Continent. Though divided politically and often at war with one another, the various tribes of Britons, notably those in the south of the island, slowly developed a civilization which, though primitive by Roman standards, included organized communities, industrial techniques, such as the mining of tin, gold, and iron, and the use of gold coinage. The Britons excelled in certain fields of art, particularly in the making of bronze weapons and ornamental jewelry.

BRITTANY (Fr. *Bretagne*), historical region of France, formerly a province and duchy, commensurate with the present-day departments of Finistère, Côtes-du-Nord, Morbihan, Ille-et-Vilaine, and Loire-Inférieure (qq.v.). The region is generally identical with the peninsula extending for about 150 m. into the Atlantic Ocean between the English Channel on the N. and the Bay of Biscay on the S. Rennes (q.v.), the former provincial capital, is the chief city. In ancient times the region formed part of *Armorica*, the center of a confederation of Cymric Celtic tribes. The Romans under General Gaius Julius Cæsar invaded the country in 56 B.C., and it subsequently became the Roman province of Lugdunensis. In the 5th and 6th centuries A.D., after the withdrawal of the Romans, many

French National Tourist Office

Woman of Brittany wearing provincial coif

Britons (Celtic natives of Britain), in flight from the Teutonic invaders of their homeland, took refuge in the N.W. part of Armorica. They gave the region its present name. The Britons (later "Bretons") gradually converted the Armorican Celts, then mainly pagans, to Christianity. During the 7th and 8th centuries a number of petty principalities developed in Brittany. These principalities became subject to the Frankish emperor Charlemagne early in the 9th century, but in 846, under a leader who had united the country against Norse invaders, the Bretons revolted against Charlemagne's grandson Charles the Bald and won independence. In the latter part of the 10th century the Bretons acknowledged the rule of the Norman dukes. Geoffrey, Count of Rennes, proclaimed himself duke of Brittany in 922. The dukedom became (1171), through marriage, a possession of Geoffrey Plantagenet, son of King Henry II of England. It reverted to a line of French dukes at Rennes early in the 13th century. Duchess Anne, heiress of Brittany, married (1491) King Charles VIII of France, and the duchy was temporarily united to France. Brittany became permanently part of France by treaty in 1532, during the reign of King Francis I, who had married Claudia, daughter of Anne. See BRETON LANGUAGE AND LITERATURE.

BRITTANY SPANIEL, one of the oldest known breeds of spaniel (q.v.). It originated in Brittany probably in the 5th century A.D. As known today, the dog developed from a variety bred in France at the beginning of the 20th century. It has a rounded skull; short ears, set high on the head; dark-brown eyes; a flat or wavy coat, either dark-orange and white or liver and white in color; a tail about 4 inches long, or, frequently, no tail; and straight front legs. The dog weighs from 30 to 40 pounds; is from 17½ to 20½ inches high at the withers; and has a body of about the same length as its height. It is used as a sporting dog, especially in hunting small game.

BRITTEN, (EDWARD) BENJAMIN (1913–), English composer, born in Lowestoft, and trained at the Royal College of Music, London, and privately under the English composer Frank Bridge. Britten was precocious as a composer, having written a string quartet at the age of nine. From 1939 to 1942 he lived and worked in the United States. He is particularly noted for his opera *Peter Grimes,* composed in 1944. The opera was first performed in London in 1945; it was subsequently produced in many American and European cities. Among Britten's other works are *Variations on a Theme of Frank Bridge,* for strings (1937); *Les Illuminations,* for voice and strings, to a text by the French poet Arthur Rimbaud (1939); the opera *Paul Bunyan* (1940); *String Quartet No. 1 in D Major* (1941); the chamber operas *The Rape of Lucretia* (first performed 1946), *Albert Herring* (first performed 1947), *Let's Make an Opera* (first performed 1950), and *The Turn of the Screw* (first performed 1954); and the grand operas *Billy Budd* (first

performed 1951) and *Gloriana* (composed for the coronation of Queen Elizabeth II, 1953).

BRITTLE STAR, common name for echinoderms of the group Ophiurida, which, with the basket fish (q.v.), constitute the class Ophiuroidea. They are found in all oceans, and are more abundant in the tropics. Brittle stars are characterized by five slender, flexible arms, which are easily broken off by any external force, and are readily regenerated. Some 2000 species comprise the group. In the largest, the body or disc is about 1 inch in diameter, and the arms about 8 inches in length. Brittle stars are widely varied in color. Their food consists of decaying matter and microscopic organisms.

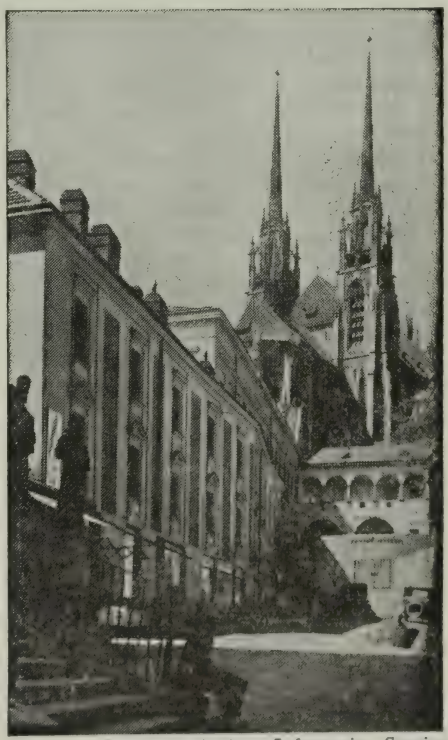
BRITTON, Nathaniel Lord (1859–1934), American botanist, born in New Dorp, Staten Island, N.Y., and educated at Columbia University. He taught geology, botany, and zoology at Columbia until his retirement as professor emeritus in 1896. From that year until 1929 he was director in chief of the New York Botanical Garden. On numerous field trips he gathered many thousands of specimens, mostly tropical flora, and was largely responsible for the rapid and extensive growth of the institution. Among his works are *Flora of Bermuda* (1918) and *The Cactaceae* (with J. N. Rose, 4 vols., 1919–23).

BRIXIA. See Brescia.

BRNO (Ger. *Brünn*), administrative center of the Region of the same name, Czechoslovakia, situated at the confluence of the Svitava and Suratka rivers, about 120 miles s.e. of Prague. It is the center of the Czech woolen-manufacturing industry. Other manufactures include cotton and linen textiles, hardware, machine guns, chemicals, soap, and beer. Coal mining and farming are the chief occupations in the surrounding region. Masarykova University, founded in 1918, and an agricultural college are located in the city. Among noteworthy edifices in Brno are the cathedral of St. Peter and St. Paul (15th century), the Rathaus (16th century), and the Landhaus (19th century).

Brno was founded in the 9th century and became a free city of the Holy Roman Empire in 1278. Strongly fortified, it was often the scene of bitter fighting, particularly in 1645, during the Thirty Years' War, and in 1809, during the Napoleonic Wars. Prior to the defeat of Austria-Hungary in World War I, the city was the capital of the crownland of Moravia. With the establishment (1918) of Czechoslovakia, it was made the capital of the province of Moravia. From 1938 to 1945 it was the capital of the German protectorate of Moravia. Brno became the administrative center of the newly created Region of the same name on Jan. 1, 1949. Area of Region, 2876 sq.m.; pop. (1948 est.) 934,437. Pop. of city (1947) 273,127.

BROACH or **BHAROCH** (anc. *Barygaza*), city of Bombay State, Union of India, situated on the n. bank of the Narbada R., about 30 m. from its mouth on the Gulf of Cambay and about 190 miles n. of Bombay. The region surrounding Broach is principally a fertile, alluvial plain; cotton, millet, and pulse are the chief crops. Industries in the city include cotton and flour milling, and handicrafts. Early in the 15th century a.d. Broach was included in the Mohammedan kingdom of Gujarat. In succeeding centuries it was successively a possession of the Mogul emperors of India, of the Marathas, and of the British, who seized it in 1772. The British ceded it to the Sindia rulers of Gwalior in 1783, but retook it in 1803. Pop., about 56,000.



Czechoslovak Govt. Information Service

View of the old part of the city of Brno with cathedral in background

BROAD, CHARLIE DUNBAR (1887–), English philosopher and educator, born in London, and educated at Cambridge University. He was successively fellow of Trinity College, assistant professor of logic at the University of St. Andrews, lecturer on logic at University College, Dundee, and professor of philosophy at the University of Bristol. From 1933 to 1953 he was professor of moral philosophy at Cambridge University, and in 1954 he became professor of philosophy at the University of California. Broad served as president of the Society for Psychical Research in 1935. Approaching philosophy from the scientific viewpoint, he expounded a theory of perception involving epistemological dualism (q.v.). His works include *Perception, Physics and Reality* (1914), *Scientific Thought* (1923), *Mind and Its Place in Nature* (1925), *Sir Isaac Newton* (1927), *Determinism, Indeterminism, and Libertarianism* (1934), *Examination of McTaggart's Philosophy* (2 vols., 1933–38), and *Religion, Philosophy, and Psychical Research* (essays, 1953).

BROADBILL. 1. Any of several ducks, especially the bluebill or shoveler (qq.v.). **2.** The broadmouth bird. **3.** A swordfish (q.v.).

BROADCASTING. See RADIO; TELEVISION.

BROADSIDE or **BROADSHEET,** in printing and publishing, a single, large sheet of paper bearing printed matter, usually in a solid block of type, i.e., without division into columns. Originated about the middle of the 15th century, the broadside was first used in Europe for royal proclamations, papal indulgences, and similar documents. About the middle of the 16th century it came into use in western Europe as a medium for political propaganda. In England, where it was most extensively employed, the broadside was used not only for political literature, but also for popular ballads, copies of which were sold on the streets of large cities by itinerant peddlers.

During the first ten years of the reign of Queen Elizabeth I of England, the names of no less than forty broadside printers were included in the Stationers' Registers, or official lists of printers licensed by the government. Comparatively few specimens of early broadsides were preserved, however, before the end of the first quarter of the 17th century. Toward the end of the 18th century, with the increase in the number of newspapers and the liberty of the press, the broadside gradually was abandoned. In comparatively recent years the collection of these sheets has become a favorite pursuit among antiquarians, as a branch of bibliomania (q.v.). Robert Harley, Earl of Oxford, assembled one of the most famous collections, now housed in the British Museum, and including 2048 broadsides, bound in 3 volumes.

In the United States, the word "broadside" is often applied to a roughly printed excerpt from a magazine sent out in advance of publication to newspapers for comment.

BROADWAY, principal business thoroughfare of New York City, bisecting Manhattan Island in a generally northward direction. Named when New York was still a small trading post at the southern end of Manhattan, Broadway grew in length and importance almost in direct ratio to the growth of the city. Today it extends from Bowling Green (q.v.) to the northern boundary of the city at 263rd Street, a distance of about 17 miles. From the city limits it continues northward up the Hudson River valley to Albany as U.S. Route Number 9. In many of the towns through which it passes the highway is known as Broadway.

From Bowling Green to City Hall, Broadway is the traditional route over which national heroes and distinguished guests visiting New York are escorted. Most of the first mile skirts the financial district centered in Wall Street. North of City Hall it passes through the wholesale-dry-goods section, and enters Union Square at 14th Street; its junction with 5th and Madison avenues at 23rd Street forms Madison Square. Broadway merges with the Avenue of the Americas (formerly 6th Avenue) at Greeley Square, the heart of the city's shopping district. At 42nd Street Broadway becomes the "Great White Way", intimately identified with America's most imposing concentration of amusement and theatrical establishments. Scores of motor-sales agencies line Broadway in the Columbus Circle neighborhood, and there it is popularly known as "Automobile Row". Beyond that point apartment buildings and neighborhood business enterprises predominate along Broadway to the northern limits of the city.

BROCA, (PIERRE) PAUL (1824–80), French surgeon and anthropologist, born at Sainte-Foy-le-Grande, Gironde. He studied medicine at Paris, and in 1867 became professor of surgical pathology on the faculty of the Academy of Medicine. Broca was noted as a surgeon and for his medical research, particularly for discovery of the speech center in the human brain, and was also a pioneer in anthropology. He founded the Paris Anthropological Society in 1870 and the *Revue*

d'Anthropologie in 1872. Among his works are *Caractère Physique de l'Homme Prehistorique* (1868) and *L'Anatomie Comparée de l'Homme et des Primates* (1869).

BROCCOLI, a vegetable, *Brassica oleracea italica,* a variety of the cabbage species. It is closely related to the cauliflower (q.v.), but has smaller, loose, green heads rather than the firm, white head of the cauliflower. It was formerly grown almost exclusively in Europe, but has become an increasingly important truck crop in the U.S.

BROCK, Sir Isaac (1769–1812), British soldier, born in St. Peter Port, Guernsey, Channel Islands. He joined the British army in 1784, and by 1797 had risen to the rank of lieutenant colonel. In 1806 he was placed in command of the British garrison at Quebec. He was promoted to the rank of major general in 1811. After the outbreak of the War of 1812 he and the American Indian chief Tecumseh led a combined force of British troops and Indians against invading United States units under the command of General William Hull. Brock's troops forced the Americans to withdraw to Detroit, their base of operations. On Aug. 16, 1812, he surrounded Detroit and compelled Hull to surrender. Brock was mortally wounded at the battle of Queenton on Oct. 13.

BROCKEN (anc. *Mons Bructerus*), highest summit of the Harz Mountains, situated in Saxony-Anhalt, East Germany, about 20 miles w.s.w. of Halberstadt. Its elevation is 3747 ft. It is noted for the phenomenon called the Specter of the Brocken (*Brockengespenst*), actually a vast shadow of the spectator looming against the mists of the mountain under certain atmospheric conditions. Brocken is also the legendary gathering place of witches on Walpurgis Night, and figures as a famous scene in *Faust* (1808–32), the drama by the German poet Johann Wolfgang von Goethe. An observatory and a hotel are situated on the summit, which is reached by a railway and modern highways.

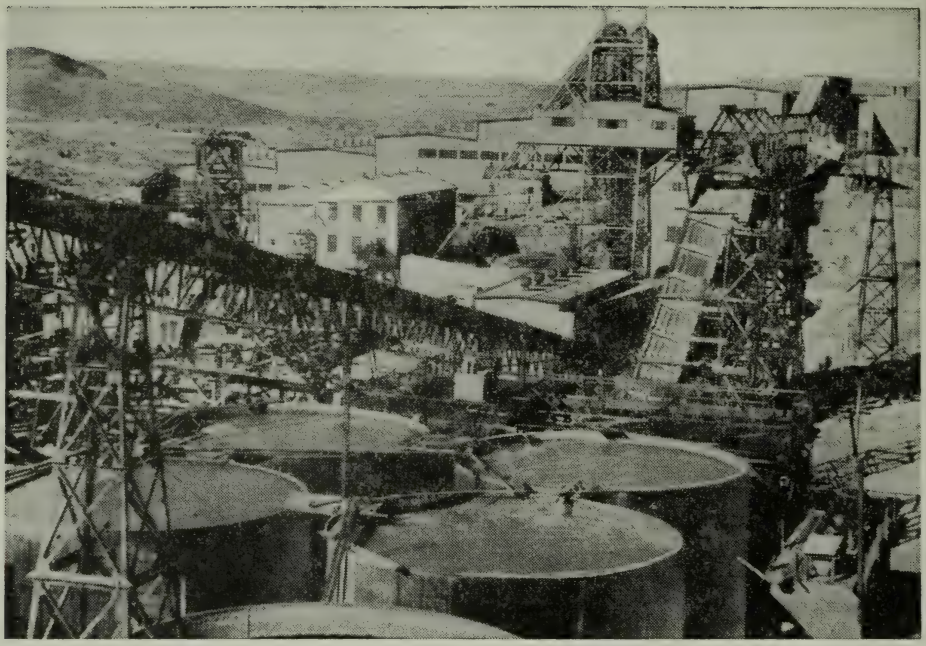
BROCKHAUS, Friedrich Arnold (1772–1823), German lexicographer, born in Dortmund, and educated at the University of Leipzig. He was the founder of a publishing firm in Leipzig which bears his name, and publisher of the encyclopedia *Konversations-Lexikon* (1st edition, 1810–11), which became known throughout the world. Brockhaus' sons and grandsons, who succeeded him in the firm, continued the *Konversations-Lexikon* through seventeen editions, and planned and published other reference works, most notably an ambitious *Allgemeine Enzyklopädie* (168 vols., 1818–1914).

BROCKHAUS, Hermann (1806–1877), German Orientalist, the third son of Friedrich Arnold Brockhaus, born in Amsterdam. In 1841 he proposed the plan of printing Sanskrit works in the Latin alphabet, and he also prepared the first European glossary of the Avestan language, which was appended to an edition of *Vendidād Sāde* (Leipzig, 1850). In 1856 he became editor of Ersch and Gruber's *Allgemeine Enzyklopädie.* In 1853 he founded the *Zeitschrift der Deutschen Morgenländischen Gesellschaft.* Among his works on oriental literature are editions of the Fables of Somadeva, *Kathâ Sarit Sagara* (1839–66); of the Persian version of the "Seven Wise Masters" (1845); and of the "Songs of Hafiz" (1854–60).

BROCKTON, city of Plymouth Co., Mass., situated about 20 miles s. of Boston. It is one of the leading centers in the United States for the manufacture of men's shoes, and has plants producing tools and machinery, lasts, patterns, welting, and other products for use in the shoe-manufacturing industry. Brockton is the trading center of a rich agricultural region. A county fair is held in the city annually. Points of interest include the D.W. Field Park, noted for its scenic beauty, and the home of the American poet William Cullen Bryant. Founded in 1700 on land deeded (1649) by the Indians to the English settlers Miles Standish and John Alden, the community formed a part of Bridgewater until 1821, when it was incorporated as North Bridgewater. In 1874 it received its present name, and in 1881 was incorporated as a city. Pop. (1950) 62,860.

BROD, Max (1884–), German writer, born in Prague, and educated at the University of Prague. He was the intimate friend and biographer of the Austrian writer Franz Kafka, whose works were published posthumously through Brod's efforts. In 1939, at the outbreak of World War II, Brod settled in Palestine (now Israel), where he became director of the Habima Theater in Tel Aviv. Brod is well known for his historical novels and biographies. His works include *Jüdinnen* (1909), *Tycho Brahes Weg zu Gott* (1916), *Reubeni* (1925), *Heinrich Heine* (1934), *Franz Kafka; Eine Biographie* (1937), *Das Diesseitswunder* (1939) and *Unambo* (1952). He wrote poems, plays, and essays on various subjects, including Zionism and pacifism.

BRODZINSKI, Kazimierz (1791–1835), Polish poet, born at Krolowka, Galicia. He



Australian News & Information Bureau

Mine at Broken Hill, New South Wales, Australia. Since 1883 its ores have yielded large quantities of gold, silver, copper, zinc, lead, and antimonial lead.

became lecturer on world literature at the University of Warsaw in 1822, after acquiring fame through two volumes of poems. Among his works is *Wieslaw* (1820), an idyllic poem of peasant life.

BROGLIE, Louis Victor, Prince de (1892–), French physicist, born at Dieppe, and educated at the Sorbonne; grandson of Jacques, Duc de Broglie. His studies were interrupted by World War I; he served in the navy throughout the war and was awarded the Cross of the Legion of Honor for his technical contributions to telegraphy. He was a lecturer at the Sorbonne from 1928 and became full professor in 1932. He is best known for his development, in 1925, of the theory known as quantum mechanics (q.v.) or wave mechanics, an attempt to rationalize the dual nature of both matter and energy as being simultaneously corpuscular and undulatory. This theory has been highly developed, particularly by the German physicists Werner Heisenberg and Erwin Schrödinger, has received experimental and theoretical verification, and has yielded results important both to an understanding of the universe and to such practical ends as the development of the atomic bomb. Louis de Broglie received many honors, including the Belgian Order of Leopold, membership in the French Academy, foreign membership in the Royal Society of London, and the 1929 Nobel Prize in physics. His writings include *Matière et Lumière* (1937), *La Physique Nouvelle et Les Quanta* (1937; Eng. trans., *Revolution in Physics,* 1953), *Continu et Discontinu* (1941), and *La Physique et Microphysique* (1947; Eng. trans., *Physics and Microphysics,* 1955).

BROKEN HILL, capital of the province of Luangwa, Northern Rhodesia, British South Africa. Zinc and lead ores are produced near the town from a mine which in addition to the ores, has yielded large quantities of fossil bones and primitive implements of Hottentot and Bushman type. In 1921 an incomplete skeleton of a primitive type of man was discovered there. This *Rhodesian Man* is believed by anthropologists to have been contemporary with, or earlier than, Neanderthal man in Europe (see Man, Ancient). Pop., about 9000.

BROKEN HILL, mining city in Yancowinna Co., New South Wales, Australia. It is the third largest city in New South Wales, and is 335 m. by rail from Adelaide and 703 m. by rail from Sydney. The mines in the vicinity of

Broken Hill have been worked since 1883, producing enormous quantities of silver, lead, zinc, and tin ores. In a recent year about 200,000 tons of silver-lead ore and concentrates, and 265,000 tons of zinc ore and concentrates were produced. Most of the zinc ore goes to the electrolytic zinc plant at Risdon, Tasmania. Broken Hill Proprietary Company Limited, the largest industrial company in Australia, was founded in 1885 to develop the Broken Hill mines.

BROKEN WIND. See HEAVES.

BROME, RICHARD (d. 1652), English dramatist. He was at first a servant to the dramatist Ben Jonson, and later his friend and follower. Brome was a writer of both realistic and romantic comedies, of which 15 are extant. The most important of these are *The Northern Lass* (1632), *The Joviall Crew* (1641), and *The City Witt* (posthumously published, 1653).

BROME GRASS, common name for fodder grasses of the genus *Bromus,* very nearly allied to fescue. There are about 40 species, found chiefly in the north temperate zone. In semiarid regions some drought-resisting species are valued highly for hay and forage. Other species become troublesome weeds and have reputedly poisonous seeds. Some undesirable species of brome grass are known as chess or cheat.

BROMELIA, a tropical American genus of stemless plants, type of the family Bromeliaceae. It is closely related to the genus *Ananas,* which includes the pineapple. Some of the 25 species of Bromelia are grown outdoors in the extreme southern U.S. and in greenhouses in the north. They have long, stiff, spiny leaves, about 2 in. wide and often 6 ft. long. From the leaves of some species, hemplike fibers are obtained commercially. The most familiar species is *B. pinguin,* the pinguin, wild pine, or wild pineapple, a native of the West Indies, often cultivated for decorative hedges in subtropical U.S. The leaves, bright green when the plant is young, turn to an attractive red shade with age. The yellowish fruit, up to 2 in. in diameter, is edible and is used to make a cooling drink.

BROMELIACEAE, the Pineapple family, tropical American monocotolydenous plants in the order Xyridales. Many of the 40 genera consist of stemless plants, often with spiny, fleshy leaves, as in *Bromelia* (q.v.) and *Ananas* (see PINEAPPLE). Others consist of epiphytes, i.e., plants which are rootless, living on trees not as parasites but as air plants. Some of these plants have cuplike folds in the leaves which hold considerable amounts of water; from this reservoir the plant draws moisture between periods of rain. In some species these reservoirs are so large that rootless water plants, bladderworts, grow in them. The only species of Bromeliaceae which is native to the U.S. is an epiphyte, Spanish moss (q.v.).

BROMELIN. See ENZYMES.

BROMFIELD, LOUIS (1896–1956), American author, born in Mansfield, Ohio. He entered Cornell University in 1914 to study agriculture, but transferred the next year to the School of Journalism of Columbia University. After the United States entered World War I he enlisted in the U.S. Army and served with an American ambulance unit attached to the French Army. Following World War I he held several editorial positions in New York City. In 1923 he returned to France, where he lived and wrote for the next 15 years. He moved back to the United States in 1939 and thereafter divided his time between writing and farming. Bromfield's first four novels, generally considered to be his best work, deal with the American scene and with the problems of characters attempting to escape family ties and tradition. Among his novels are *The Green Bay Tree* (1924); *Possession* (1925); *Early Autumn* (1926), which won the Pu-

Harper & Bros.

Louis Bromfield

litzer Prize; *The Strange Case of Miss Annie Spragg* (1928); *Twenty Four Hours* (1933); *The Rains Came* (1937); *Night in Bombay* (1939); *Mrs. Parkington* (1943); *What Became of Anna Bolton?* (1944); *Colorado* (1947); *The Wild Country* (1948); and *Mr. Smith* (1951). His other works include the play *De Luxe* (1935); a book of short stories, *World We Live In* (1944); a collection of short novels, *Kenny* (1947); and the nonfiction works *Pleasant Valley* (1945), *A Few Brass Tacks* (1946), *New Pattern for a Tired World* (1954), *From My Experience* (1955), and *Animals and Other People* (1955).

BROMIDE, chemical compound of bromine and a metallic element or a positive radical; a salt formed by the reaction of hydrobromic acid with metals, bases, oxides, or organic radicals. Most metallic bromides are solids at ordinary temperatures, and are easily melted and volatized. Except for the bromides of silver, mercury, and palladium, the metallic bromides are soluble in water; lead bromide, however, is soluble only in hot water. Most nonmetallic bromides are liquids, readily decomposed by water, and organic bromides are extensively used as intermediates in the synthesis of complex chemical compounds. Silver bromide, because of its instability on exposure to light, is widely used in photographic emulsions. In medicine the alkaline bromides are standard sedatives for hysteria, alcoholic intoxication, and epilepsy. Excessive and prolonged use of bromides may lead to bromism, a disorder characterized by headache, mental dullness and depression, weakening of the heartbeat, and skin eruption.

BROMINE, an element, symbol Br, at. no. 35, at. wt. 79.916, m.p. –7.2° C. (19° F.), b.p. 58 8° C. (138° F.). Although widely distributed in nature, it is so similar in its chemical properties to chlorine, with which it is almost invariably associated, that it was not recognized as a separate element until 1826, when it was discovered and isolated by the French chemist Antoine Jérôme Balard (1802–76).

Bromine at ordinary temperatures is a dark, reddish-brown liquid of sp. gr. 3.1, and is almost exactly as viscous as water. It is extremely volatile, giving off a poisonous, suffocating, reddish vapor composed of diatomic molecules. If the liquid comes in contact with the skin it causes sores which are healed with great difficulty. Bromine is slightly soluble in water, 100 parts of the latter dissolving about 4 parts of bromine when cold or 3 parts when hot; at temperatures below 44° F. (7° C.) it forms with water a solid, reddish hydrate, $Br_2 \cdot 10H_2O$. In the presence of alkalies bromine reacts chemically with water to yield a mixture of hydrobromic acid, HBr, and hypobromous acid, HOBr. Bromine is very soluble in a wide variety of organic solvents, such as alcohol, ether, chloroform, and carbon disulfide. It reacts chemically with many compounds and metallic elements, being only slightly less active than chlorine.

Bromine does not occur in nature as the free element, being found usually in the compounds called bromides (q.v.). Formerly it was used chiefly in such compounds. The free element was also used, in the preparation of certain dyes. More recently the chief use of bromine has been in the preparation dibromoethane (commonly called ethylene bromide), a constituent of "Ethyl" antiknock fluid for gasoline. Bromides were formerly a by-product of the production of common salt or of potassium from brines rich in bromides. Elementary bromine, if required, was prepared from bromides by treatment with manganese dioxide or sodium chlorate. More recently, increasing demand has led to the production of bromine from sea water, which contains on the average 64 parts of bromine per million. The bromine is liberated by treating the sea water with chlorine.

BRONCHITIS, inflammation of the mucous membrane lining the bronchi and bronchial tubes. Acute bronchitis is accompanied by fever, pain under the breastbone, severe coughing, and often by the secretion of large quantities of sputum. The disease may be caused by infectious organisms, or by the inhalation of irritant vapors or dust. Capillary bronchitis, a form of acute bronchitis which affects the finest branches of the bronchi, often develops into lobular (broncho-) pneumonia, especially in young children. Chronic bronchitis, less severe in its symptoms, may result from repeated attacks of acute bronchitis, or from other chronic systemic maladies.

BRONCO or **BRONCHO** (Span., "wild"), a small, semiwild horse of Mexico and the western plains of the United States. Brought to America by the early Spanish explorers, the progenitors of the present-day bronco escaped from their original owners and from their Indian captors, adapted themselves to the western habitat, and multiplied in large numbers. Subsequently many of them were captured and domesticated by Indians, notably the Cayuse (q.v.) tribe whose name

is applied to the bronco in parts of w. United States. Broncos were also captured by plainsmen, tamed, and interbred with horses from the eastern States. The offspring of this union are endowed with remarkable endurance and intelligence, and are valued as saddle ponies and pack horses.

BRONK, DETLEV W. (1897–), American biophysicist and administrator, born in New York City, and educated at Swarthmore College and at the universities of Pennsylvania and Michigan. He was Johnson professor of biophysics and director of the Johnson Foundation for Medical Physics (1929–49) at the University of Pennsylvania, and served also as director of the Institute of Neurology (1936–40, 1942–49) and as professor of physiology (1940–41) at Cornell Medical College. Bronk was president of Johns Hopkins University from 1949 to 1953, when he became president of the Rockefeller Institute for Medical Research. A pioneer in the study of physiological changes induced by high-speed and high-altitude flight and an able administrator, he served during World War II on many national and international committees dealing with biophysics and aviation medicine. In 1946 he became chairman of the National Research Council, and in 1955, chairman of the National Science Board. He was elected president of the National Academy of Sciences in 1950, and in 1952 he served as president of the American Association for the Advancement of Science.

BRONTË, CHARLOTTE (1816–55), EMILY JANE (1818–48), and ANNE (1820–49), English writers, known as the Brontë sisters, born in Thornton, Yorkshire. Their father was curate of Haworth in the Yorkshire moors, and the girls received their early education in his parsonage. Charlotte and Emily spent a year at a school for the daughters of clergymen, and the three sisters later attended Margaret Wooler's school for girls in Dewsbury. Subsequently Charlotte and Anne worked for a time as governesses. In 1842 Charlotte and Emily spent eight months in a school in Brussels, Belgium, where, in 1843, Charlotte taught English.

All three girls had been writing verses, each concealing her work from her sisters. In 1845 they became aware of each other's secret efforts and, in the following year brought out at their own expense a volume of their poems, under the pseudonyms Currer, Ellis, and Acton Bell. The book attracted little notice; only two copies were sold.

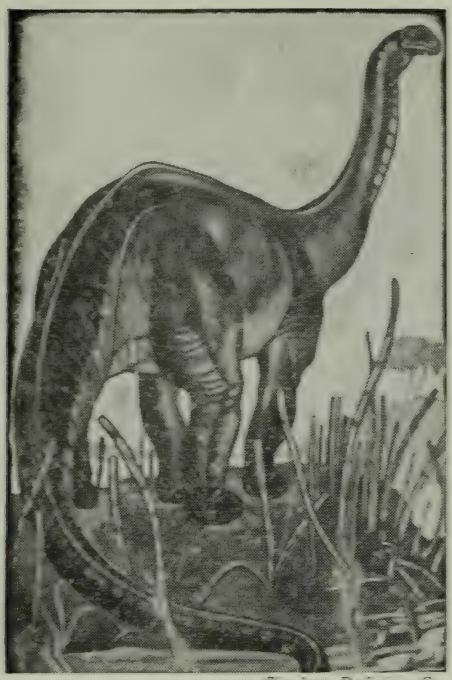
Charlotte's novel *Jane Eyre,* containing a

Charlotte Brontë

fictional account of her unhappy experience at the school for clergymen's daughters, was published in August, 1847, and met with immediate success. Emily's grim and tragic novel *Wuthering Heights,* set in the bleak Yorkshire moors, and Anne's partly autobiographical novel of her unpleasant experience as a governess, *Agnes Grey,* were both published in December, 1847. Anne's second work, *The Tenant of Wildfell Hall,* appeared in 1848. Charlotte's novel *Shirley* (1849) was an idealized portrait of her sister Anne, and her *Villette* (1853) was based on her experiences in Brussels. The year before her death Charlotte married her father's curate, Arthur Bell Nicholls.

The novels of Charlotte and Emily are remarkable for their insight into character, and for the frankness with which they depicted the passions of their heroines, at a time when Victorian traditions in England dictated that women be portrayed as gentle creatures who lived conventional and passionless lives. Emily Brontë was also a poet of distinction. Her *Old Stoic* (contained in *Poems*) and her *Last Lines* (published posthumously) are notable contributions to English poetry.

BRONTOSAURUS (Gr. *bronte,* "thunder"; *sauros,* "lizard"), a gigantic herbivorous dinosaur of the suborder Sauropoda, the fossil remains of which are found in the upper Jurassic strata of Wyoming. The animal was of massive build and attained the great



Sinclair Refining Co.

Brontosaurus, of the Mesozoic era

length of 60 feet, with an estimated weight for the live beast of 20 tons. The trunk of the body was short and thick, the neck long and slender, the tail large and strongly built, and the head remarkably small. The fore limbs were as long as the hind limbs, indicating that the animal walked on all fours; the feet were plantigrade, i.e., the beast walked on the flat foot instead of on the toes, and the footprints covered a square yard of ground. The bones of the limbs were all solid and heavily built. See DINOSAURIA.

BRONX, THE, one of the five boroughs of New York City, coextensive with Bronx Co., N.Y., and the only New York City borough located on the New York State mainland. It is bounded on the N. by Westchester Co., on the E. by Long Island Sound, on the S. by the East R., on the S. and W. by the Harlem R., and on the W. by the Hudson R. North Brother and Riker's islands, in the East R., and City and Hart's islands, in Long Island Sound, form part of the borough. It has a total area of 43.4 sq.m. (excluding inland-water surface), and about 80 m. of water front. The extreme length of the borough N. and S. is 8.1 m.; its greatest width E. and W. is 9.2 m. Flowing through the central section into the East R. is the Bronx R., which varies from a few inches to 10 ft. in depth and from 10 to 300 ft. in width. The Hutchinson R., another small stream, flows through the northeastern corner of the borough into Eastchester Bay on Long Island Sound. A series of N. and S. ridges, classified geologically as foothills of the Green Mts. and Berkshire Hills, is the dominant feature of the terrain. The highest elevation, 284.5 ft., is in the western section.

The Bronx is primarily a residential area, with a much larger ratio of apartment dwellings than any other borough of the city. Industrial activity, a very small fraction of the total for the city as a whole, is concentrated in the southern region extending eastward from the Harlem R., to Hunts Point.

Transit and Transportation Facilities. Municipal subway and elevated systems provide rapid transportation between the Bronx and Manhattan, and thence to all important areas of the city. A network of bus lines provides connections between all sections of the borough. Two railroad systems, the New York Central and the New York, New Haven & Hartford, maintain a number of freight and passenger terminals in the borough. The Hell Gate Bridge, spanning the East River between the Bronx and Queens, carries traffic of the N.Y., N.H. & H.R.R. and of the Pennsylvania R.R. Traffic of the N.Y.C.R.R. crosses the Harlem River between the Bronx and Manhattan by means of two railroad bridges. Vehicular and pedestrian traffic moves to and from Manhattan across eleven bridges over the Harlem River. The Triborough Bridge (opened 1936) links the borough with Randall's Island, Manhattan, and Queens. Another link between the Bronx and Queens is provided by the Bronx-Whitestone Bridge (opened 1939). Boston Road (U.S. 1), a major highway leading to New England, crosses the borough in a northeasterly direction. Paved streets in the borough aggregate nearly 800 m.

Residential Areas and Islands. Originally a part of suburban, rural Westchester Co., the borough has retained its suburban character chiefly in the area (adjacent to the Hudson R.) known as Riverdale, a section with numerous landscaped estates and one-family homes. Other well-defined localities include the Mott Haven, Morrisania, and St. Mary's Park neighborhoods, in the southwestern section; University Heights, on high ground overlooking the Harlem R.; the Jerome Park neighborhood, along the northern reaches of

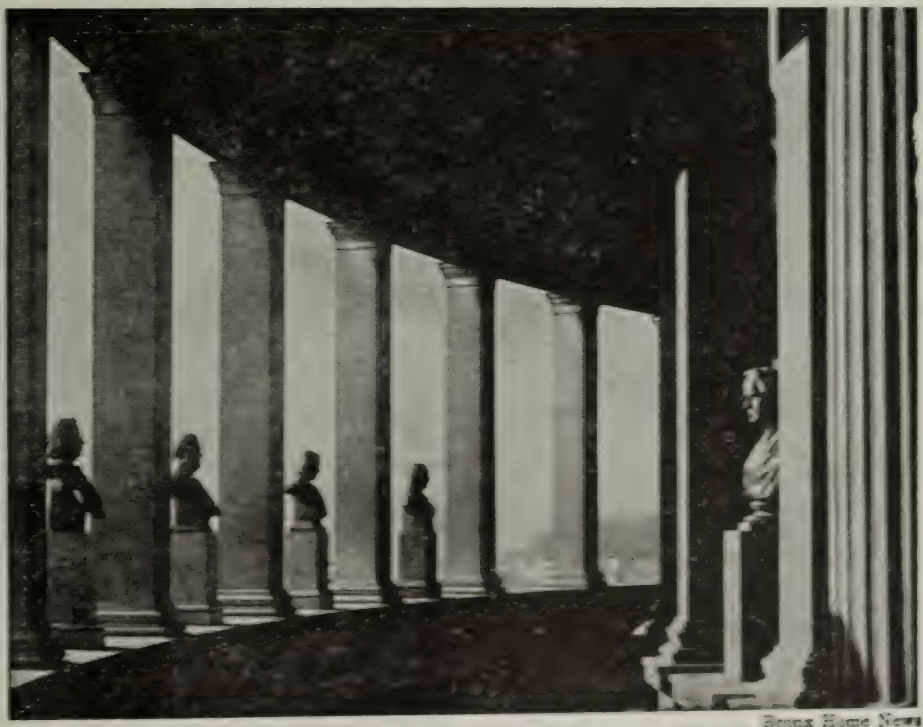
the Grand Concourse, a major thoroughfare; and the Kingsbridge, Williamsbridge, Woodlawn, and Westchester Heights neighborhoods. Several of the communities in the eastern part of the borough are poorly developed and thinly populated.

Riker's, Hart's, and North Brother islands are utilized by departments of New York City for institutional purposes. City Island is a popular yachting resort and boatbuilding center.

Schools, Libraries, and Churches. The public-school system in the borough includes more than 100 day elementary schools, 12 day high schools, 2 evening high schools, and 2 evening trade schools, with a total enrollment of over 175,000 students, about 20 percent of the total for the entire city. In addition there are 60 Roman Catholic parochial elementary schools with nearly 40,000 students and 19 Roman Catholic parochial high schools with about 9000 students. Outstanding among the institutions of higher education located in the borough are Fordham University (q.v.), the University Heights Center of New York University (see NEW YORK UNIVERSITY), Manhattan College (q.v.), the College of Mount St. Vincent-on-Hudson, New York State Maritime Academy, the Bronx Center of Hunter College (see HUNTER COLLEGE), and the Webb Institute of Naval Architecture, a school for marine architects and home for aged shipbuilders. Also located in the borough is the New York Institute for the Education of the Blind, a free school for visually handicapped children and adolescents. The New York Public Library (q.v.) maintains branches in 20 different localities in the Bronx.

Churches and synagogues in the borough number about 200, and total membership is approximately 150,000. Among the historic church edifices in the Bronx are St. Ann's Church, the crypt of which contains the remains of several eminent early residents, notably Lewis Morris, signer of the Declaration of Independence; and St. Paul's Protestant Episcopal Church, constructed in 1765.

Parks and Boulevards. Parks, playgrounds, recreation areas, and parkways occupy 3603 acres of the Bronx, more than 20 percent of its total acreage and more space, proportion-



Bronx Home News

Hall of Fame of New York University, University Heights, the Bronx

ately, than in any other borough of the city. Bronx Park, covering 721 acres in the central section of the borough, is among the outstanding American urban parks. Besides many scenic attractions, the park contains the New York Zoological Park, with 830 species of mammals, birds, and reptiles; and the New York Botanical Gardens, with thousands of species of living, preserved, and fossilized plants. Pelham Bay Park, occupying 2130 acres in the northeastern corner of the borough, is the largest park in New York City. Outstanding among its numerous recreational facilities is Orchard Beach, a bathing beach on Long Island Sound. Other well-known parks in the Bronx are Van Cortlandt Park, 1146 acres, in the northwestern section of the borough, and Crotona Park, located a short distance s.w. of Bronx Park.

The Bronx has several excellent boulevards, including the Bronx-Pelham Parkway, linking Bronx and Pelham Bay parks; Moshulu Parkway, from Bronx Park to Van Cortlandt Park; the Hutchinson River Parkway, which extends north from the Bronx-Whitestone Bridge to connections with the Westchester Co. parkway system; Bruckner Boulevard, paralleling the East R.; the Bronx River Parkway, along the Bronx R. valley from Sound View Park to the Mt. Vernon city line; and the Henry Hudson Parkway, which enters the Bronx at the Henry Hudson Bridge over Spuyten Duyvil Creek, the western end of the Harlem R., and crosses the Riverdale neighborhood and Van Cortlandt Park to Westchester County.

Industry. The chief industries of the Bronx include the manufacture of pianos, paints, printing presses, gypsum board, clothing, plywood and paper, food, and metal products. Several shipyards and a number of printing plants are located in the borough. In a recent year the value of all products manufactured in the Bronx totaled about $115,000,000.

Government. See NEW YORK (CITY): *Government.*

History. The Dutch West India Company, a trading organization of the Netherlands, acquired the site of the Bronx, which was known to the Indians as Keskeskeck, in 1639. Colonization of the region began in 1641, when Jonas Bronck, a Dutch citizen of Scandinavian origin, purchased about 500 acres of land in the south-central section and established a farm. In 1642 Ann Hutchinson, a religious dissenter from New England, settled near what is now the Hutchinson R. Despite hostile Indians and tyrannical Dutch rule the territory attracted additional colonists, notably John Throgmorton, who built (1643) a home in the area now identified as Throg's Neck, and Thomas Pell, who settled (1654) in the section named for him, Pelham Bay. The village of Westchester was founded in 1657. Following British occupation (1664) of New Netherland, increasing numbers of colonists settled in the area adjoining Manhattan on the north, among them Colonel Lewis Morris, who bought the Bronck estate in 1670, and for whom the community of Morrisania was later named. The Bronx region was attached to Westchester Co. in 1683, and the town of Westchester (now part of the Bronx) was designated as the county seat. King's Bridge, the first bridge across the Harlem R., was constructed in 1693. About this time several wealthy New York merchants, including Frederick Philipse and Oloff Van Cortlandt, established manorial estates in the region. In 1759 the county seat was removed from Westchester to White Plains.

Fortifications were erected in the Kingsbridge section after the outbreak of the American Revolution, but these positions fell to the British early in October, 1776. The only significant battle fought in the Bronx region during the war occurred in what is now Pelham Bay Park on Oct. 18, 1776. American troops engaged a British contingent commanded by General William Howe, inflicting severe casualties and enabling General George Washington to withdraw his forces north to White Plains.

In 1790 the entire population of the Bronx section of Westchester Co. totaled only 1761, and during the next thirty years it increased by little more than 1000. The Bronx registered no substantial growth until the years between 1840 and 1870, when the population increased from 5346 to 37,393. New communities established during this period included West Farms, Morrisania, and Mott Haven. In 1874 New York City annexed Morrisania, Kingsbridge, and West Farms, the townships then comprising the entire western portion of the Bronx. The townships which comprised the eastern portion were absorbed by the city in 1895. By the terms of legislation enacted by the New York State Legislature in 1897, creating Greater New York, the Bronx became a borough of the city on Jan. 1, 1898. It was established as a separate county in 1914.

Population. 1880, 51,980; 1900, 200,507; 1910, 430,980; 1920, 732,016; 1930, 1,265,258; 1940, 1,394,711; 1950, 1,451,277.